This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

Stanford University Libraries
3 6105 127 808 116

THE

EXECUTIVE DOCUMENTS

OF THE

SENATE OF THE UNITED STATES

FOR THE

SECOND SESSION OF THE FIFTY-SECOND CONGRESS AND
THE SPECIAL SESSION OF THE SENATE
CONVENED MARCH 4, 1893.

1892-'93.

IN NINE VOLUMES.

Volume 1.—Nos. 1 to 19, inclusive.
Volume 2.—Nos. 20 to 68, inclusive, except Nos. 37, 38, 63, and 66.
Volume 3.—No. 37, Part 1.
Volume 4.—No. 37, Part 2.
Volume 5.—No. 38, Part 1.
Volume 6.—No. 65.
Volume 7.—No. 66.
Volume 8.—Nos. 69 to 107, inclusive (except Nos. 84 and 96), and Nos. 1 to 4, inclusive, Special Session.
Volume 9.—Nos. 84 and 96.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1893.

A 19245

LELAND STANFORD JUNIOR
LIBRARY
UNIVERSITY

INDEX

TO

THE EXECUTIVE DOCUMENTS

OF THE

SENATE OF THE UNITED STATES

FOR THE

SECOND SESSION OF THE FIFTY-SECOND CONGRESS AND THE SPECIAL SESSION OF THE SENATE CONVENED MARCH 4, 1893.

Subject.	No.	Vol.
A.		
Agricultural colleges. Report of disbursements for the support of	104	8
Agriculture, Secretary of. Letter. Bureau of Animal Industry, Report of, for 1892	20	2
American Republics. Second annual report of the Bureau of the	84	9
American Republics. Certain bulletins of the Bureau of	96	9
Arkansas. Electoral vote of	5	1
Attorney-General. Letters:		
Deficiency appropriation bill, recommending certain changes in the pending	62	2
Fox and Wisconsin Rivers improvement. Relative to awards and judgments in the matter of the	90	8
Office of the, estimate of deficiency appropriation for the	48	2
Judgments adverse to the Government, list of	97	8
Indian tribes, relative to moneys paid to attorneys for	23	2
Indian depredation claims, relative to number of cases entered in the Court of Claims, etc	21	2
Indian depredations, cases, report of the Court of Claims in	32	2
Indian depredations. A list of judgments in favor of claimants against the United States for loss by	60	2
Indian depredation cases. Relative to judgments by the Court of Claims in	93	8
B.		
Banking statistics from 1830 to 1863. (Part 1.)*	38	5
Baltimore. Relative to the claim of the city of	14	1
Baltimore. Relative to the 1812 war claim of	13	1
Bimetalism. Report of the Secretary of the Treasury relative to	2	1
Brubaker, Captain. Relative to the capture and imprisonment of, by Honduras officials. (Special Session)	1	8
Bureau of American Republics. Second annual report of the	84	9
Bureau of American Republics. Bulletins of the	96	9
Bureau of Animal Industry. Report of, for 1892	20	2
Burial of Indigent Soldiers. Estimate of deficiency appropriation for	85	8
Busch Building. Report relative to the condition of the	75	8
Busch Building. Letter of the Secretary of the Treasury relative to the condition of the	78	8

*To consist of three parts. Only one ready at this time, May, 1893.

Subject.	No.	Vol.
C.		
Canada. Relative to the transportation of imported goods and domestic products through	40	2
Cannon, George Q. Relative to the claim of	43	2
Chinese immigration. Correspondence between the Governments of the United States and China relating to	54, 65	2, 6
Cholera. Letter of the port physician of Philadelphia relative to the introduction of	13	1
Claims allowed, supplemental list of	101	8
Claims allowed under exhausted appropriations, list of	98	8
Claim of the city of Baltimore. Relative to the	14	1
Coast and Geodetic Survey. Report of the Superintendent of the. (Parts 1 and 2)	37	3, 4
Columbian Exposition. Estimate of appropriation to enable the President to entertain certain distinguished visitors to the	55	2
Commissioner of Education. Report on the public schools of the District of Columbia	12	1
Commission of Labor. Letter. Compulsory insurance of workingmen in Germany. Report on the	66	7
Compulsory insurance of workingmen in Germany. Report on	66	7
Confederate records. Estimate of appropriation for insuring the	50	2
Consular and diplomatic service. Estimates of amounts found due on account of the	89	8
Contagious and infectious diseases. Relative to the introduction of, at the port of New York	52	2
Court of Claims. Report of the, relative to Indian depredation cases	32	2
Supplemental list of judgments of the	103	8
Supplemental list of judgments rendered by the	59	2
Currency receipts and payments. Letter of the Secretary of the Treasury relative to	2	1
D.		
Deficiency appropriation bill. Letter of the Attorney-General recommending certain changes in the	62	2
Department of Labor. Estimate of appropriation for certain expenses of the	69	8
District of Columbia. Estimate of appropriation for the	49	2
E.		
Electors for President and Vice-President, a copy of the vote for, in the State of—		
Arkansas	5	1
Georgia	6	1
Maryland	7	1
New Hampshire	8	1
Encampment of troops at Chicago. Letter of the adjutant-general of Maryland relative to	24	2
F.		
Fees of consular officers. Letter of Secretary of State relative to	44	2
Fernandina, Fla. Relative to the improvement of the approaches to the harbor of	19	1
Relative to improvements of the entrance to the port of	91	8
Fish hatchery, Texas. Estimate of appropriation for the	105	8
Fox and Wisconsin Rivers improvement. Relative to awards and judgments in the matter of the	90	8
Furniture for public buildings. Estimate of appropriation for	79	8
G.		
Gallagher, Charles. Relative to the claim of	87	8
Geological maps. Estimate of appropriation for	63	2

Subject.	No.	Vol.
eorgia. Electoral vote of	6	1
reat Lakes. Message from the President relative to the naval forces on the	9	1
H.		
Iarbor of Philadelphia. Relative to proposals for the improvement of the	102	8
Iawaii. Draft of an uncompleted treaty with	45	2
Iawaiian Islands. Treaty of annexation made with the provisional government of the	76	8
Correspondence between the United States and the, from 1820 to 1893	78	8
Iospital at Rock Island Arsenal. Estimate of appropriation for	47	2
I.		
Immigration. Forms and correspondence relative to the execution of the act of March 3, 1893. (Special Session)	4	8
Inauguration stands. Letter of the Secretary of War relative to the erection of	94	8
Indian agents and attorneys. Relative to contracts made with	18	1
Indian depredation claims. Report of the number of cases of, filed in the Court of Claims, etc	21	2
Indian depredation cases. Report of the Court of Claims relative to	32	2
Indian depredations. A list of judgments in favor of claimants against the United States for loss by	60	2
Indian depredation cases. Relative to judgments by the Court of Claims in	92	8
Indian depredations. Relative to claims of friendly Indians for depredations committed during the Pine Ridge disturbance	93	8
Indian lands in Oklahoma. Relative to the cession of	17	1
Indian trust funds. Relative to claims against	19	1
International Monetary Conference. Report of the United States commissioners to the	82	8
International naval review. Estimate for an appropriation for the expenses of the	42	2
Interior, Secretary of the. Letters.		
Agricultural Colleges. Report of disbursements for the support of	104	8
Attorneys on behalf of Indian tribes. Relative to money paid to	23	2
Indian agents and attorneys. Relative to contracts made with	18	1
Indian depredations. Relative to claims of friendly Indians for depredations committed during the Pine Ridge disturbance	93	8
Indians in Oregon. Relative to a treaty negotiated with, by Joel Palmer	34	2
Indian trust funds. Relative to claims against	15	1
Maritime Canal Company of Nicaragua. Report of the	1	1
Northern Pacific RailroadCompany. Relation to the grant made to the	106	8
Pacific Railway Company. Report of the Government directors of the	4	1
Pension building. Relative to the use of the, for Sunday concerts. (Special Session.)	2	8
Public schools of the District of Columbia. Report of the Commissioner of Education on the	15	1
Schools in Utah. Report of the Commissioners of	30	2
Siletz Indians. Statement by the commission appointed to treat with the	39	2
Spoliation of lands granted to the State of California in 1864	22	2
Spoliation of lands granted to the State of California	67	2
Supplies for Indian service. Relative to the purchase of	33	2
J.		
Judgments adverse to the Government. List of	97	8

Subject.	No.	Vo
L.		
Letter-carriers. Relative to compensation of	11	
Light-House Board. Relative to a deficiency appropriation for the	56	
M.		
Machine guns of small caliber. Relative to the purchase of	41	
Mackinaw National Park. Report of the condition of the	28	
Maritime Canal Company of Nicaragua. Report of the	1	
Maryland. Electoral vote of	7	
Military Prison at Fort Leavenworth, Kans. Estimate of appropriation for the support of	64	
Militia forces of the United States. Abstract of the	51	
Mines in the Territories. Estimate of appropriation for inspecting	53	
Montana. Estimate of appropriation to pay the expenses of the messenger sent to obtain the electoral vote of	73	
N.		
Navajo Indian country. Report of the condition of the	68	
Naval forces on the Great Lakes. Message from the President relative to	9	
Naval officers' claims for sea pay. Report relative to	71	
New Hampshire. Electoral vote of	8	
Nicaragua Canal. Report of Maj. McFarland on the	46	
Northern Pacific Railroad Company. Letter of the Secretary of the Interior relative to the grant made to the	106	
O.		
Officers of the Navy. Estimates of amounts found due certain	95	
Officers of the Navy. Supplemental estimate of amounts due certain	100	
Oregon Indians. Relative to a treaty negotiated with, by Joel Palmer	34	
Ozama River bridge at San Domingo. Message from the President relative to the building of the, by American citizens	81	
P.		
Palmer, Joel. Relative to treaty negotiated with certain Indian tribes in Oregon	34	
Pawnee Indians. Relative to the cession of lands belonging to the	16	
Pennsylvania. Relative to claim for money expended in 1864	10	
Pension agents. Estimate of deficiency appropriation for salaries and expenses of	86	
Pension building. Relative to the use of the, for Sunday concerts. (Special Session)	2	
Persons employed in the Treasury Department during 1892. List of	83	
Philadelphia. Relative to proposals for the improvement of the harbor of	102	
Postal service. Supplemental estimate of deficiency appropriation on account of the	88	
Postmaster-General. Letters:		
Burch building. Report relative to the condition of the	75	
Letter-carriers. Relative to compensation of	11	
President. Message from the:		
Brubaker, Capt. Relative to the capture and imprisonment of, by Honduras officials. (Special Session.)	1	
Chinese immigration. Correspondence between the Governments of the United States and China relating to	54	
Chinese immigration. Correspondence between the United States and China relative to	65	
Hawaii. Draft of an uncompleted treaty with	45	
Hawaiian Islands. Treaty of annexation made with the provisional government of the	76	

Subject.	No.	Vol.
President. Message from the—Continued.		
Hawaiian Islands. Correspondence respecting the relations between the United States and the, from 1820 to 1893	77	8
Indian lands in Oklahoma. Relative to the cession of	17	1
Navajo Indian country. Report upon the condition of the	68	2
Naval forces on the Great Lakes. Relative to	9	1
Ozama River bridge at San Domingo. Relative to the building of the, by American citizens	81	8
Pawnee Indians. Relative to the cession of lands belonging to the	16	1
Riley, Frank B. Relative to the killing of, in Genoa, Italy	35	2
Sandwich Islands. Correspondence between the United States and Great Britain relative to the	57	2
Transportation of imported goods and domestic products through Canada	40	2
Treaty relations. Relative to the effect on, of pending legislation on the subject of immigration	25	2
Public building in the city of New York. Relative to a site for a	27	2
Public buildings. Relative to the control and supervision of	26	2
Public building at Lincoln, Nebr. Estimate of appropriation to pay certain employés upon	70	8
Public schools of the District of Columbia. Report of the Commissioner of Education on the	12	1
R.		
Revised Statutes of the United States. Estimate of appropriation for printing the	99	8
Riley, Frank B. Relative to the killing of, in Genoa, Italy	35	2
S.		
Sandwich Islands. Correspondence between the United States and Great Britain relative to the	57	2
Salmon fisheries of Alaska. Report relative to the	31	2
Schools in Utah. Report of the Commissioners of	30	2
Seal Islands. Reports of special agents to the	107	8
Siletz Indians. Statement by the commission appointed to treat with the	39	2
Souvenir coins in aid of the Columbian Exposition. Relative to the distribution of the	29	2
St. Albans, Vt. Report relative to United States building at	36	2
State Department. Estimate of appropriation for contingent expenses of the	80	8
State, Secretary of. Letters:		
Bulletins of the Bureau of American Republics	96	9
Elections for President and Vice-President. Copy of the vote for, in the State of—		
Arkansas	5	1
Georgia	6	1
Maryland	7	1
New Hampshire	8	1
Fees of consular officers. Relative to	44	2
Spoliation of lands granted to the State of California in 1864	22	2
Spoliation of lands granted to the State of California	67	2
Springfield Armory. Report of expenditures and work at	3	1
Superintendent of the Coast and Geodetic Survey. Report of the	37	2
Supplies for the Indian Service. Relative to the purchase of	33	2
Surveyor-general of Montana. Estimate of appropriation for the office of the	72	8
T.		
Transportation of imported goods and domestic products through Canada	40	2

Subject.	No
Treasury, Secretary of the. Letters:	
Attorney-General. Estimate of deficiency appropriation, for the office of	4
Baltimore. Relative to the claim of the city of	1
Banking statistics from 1830 to 1863. (Part 1)	8
Bimetallism. Report relative to	
Burial of indigent soldiers. Estimate of deficiency in the appropriation for the	8
Busch building. Relative to the condition of the	7
Cannon, George Q. Relative to the claim of	4
Claims allowed under exhausted appropriations. List of	9
Claims allowed. Supplemental list of	10
Confederate Records. Estimate of appropriation for indexing the	8
Consular and diplomatic service. Estimates of amounts found due on account of	8
Contagious or infectious diseases. Relative to the introduction of, at the port of New York	8
Court of Claims. Supplemental list of judgments rendered by the	8
Court of Claims. Supplemental list of judgments by the	10
Department of Labor. Estimate of appropriation for certain expenses of	6
District of Columbia. Estimate of deficiency appropriation for the	4
Fish hatchery, Texas. Estimate of appropriation for the	10
Furniture for public buildings. Relative to an appropriation for	7
Gallagher, Charles. Relative to the claim of	8
Geological maps. Estimate of appropriation for	6
Hospital at Rock Island Arsenal. Estimate of an appropriation for the	4
Immigration. Forms and correspondence relative to the execution of the act of March 3, 1893. (Special Session)	
International naval review. Estimate for an appropriation for the expenses of the	4
Light-House Board. Relative to a deficiency appropriation for the	8
List of persons employed in the Treasury Department during 1892	8
Machine guns of small caliber. Relative to the purchase of	4
Military prison at Fort Leavenworth, Kans. Estimate for a deficiency appropriation for the support of the	6
Mines in the Territories. Estimate of appropriation for inspecting	8
Montana. Estimate of appropriation to pay the expenses of the messenger sent to obtain the electoral vote of	7
Naval officers' claims for sea pay. Report relative to	7
Officers of the Navy. Estimate of amounts found due certain	8
Officers of the Navy. Supplemental estimate of amounts due certain	10
Pension agents. Estimate of deficiency appropriation for salaries and expenses of	8
Port physician of Philadelphia. Relative to the introduction of cholera	1
Postal service. Supplemental estimate of deficiency appropriation on account of the	8
Public buildings. Relative to the control and supervision of	2
Public building in the city of New York. Relative to the site for a	2
Public building at Lincoln, Nebr. Estimate of appropriation to pay certain employés upon the	7
Revised Statutes of the United States. Estimate of appropriation for printing	9
Salmon fisheries of Alaska. Report relative to the	8
Seal Islands. Reports of special agents to the	10
Souvenir coins in aid of the Columbian Exposition, relative to the distribution of the	2
State Department. Estimate of appropriation for the contingent expenses of	8
Surveyor-general of Montana. Estimate of appropriation for the office of the	7
Unexpended balances of appropriations. Asking authority to use	8
United States building at St. Albans, Vt. Report relative to	8

Subject.	No.	Vol.
Treasury, Secretary of the. Letters—Continued.		
United States officers in New York. Estimate of appropriation to pay certain accounts of	61	2
Visitors to the Columbian Exposition. Estimate of appropriation, to enable the President to entertain certain distinguished	55	2
Wool. Report of the commissioners to select samples of, for use in the custom-houses. (Special Session)	3	8
World's Columbian Exposition. Report relative to the appropriation in aid of the	74	8
Treaty relations. Relative to the effect of pending legislation on	25	2
U.		
Unexpended balances of appropriations. Relative to the use of, by the Secretary of the Treasury	58	2
Union Pacific Railway Company. Report of the Government directors of the	4	1
United States officers in New York. Estimate of appropriation to pay certain accounts of	61	2
V.		
Visitors to the Columbian Exposition. Estimate of appropriation to enable the President to entertain certain distinguished	55	2
W.		
War, Secretary of. Letters:		
Encampment of troops at Chicago. Letter of the adjutant-general of Maryland relative to	24	2
Fernandina, Fla. Relative to improvements of the entrance to the port of	91	8
Fernandina, Fla. Relative to the improvement of the approaches of the harbor of	19	1
Inauguration stands. Relative to the erection of	94	8
Mackanaw National Park. Report of the condition of the	28	2
Militia forces of the United States. Abstract of the	51	2
Nicaragua Canal. Report of Maj. McFarland on the	46	2
Pennsylvania. Relative to the claim of, for money expended in 1864	10	1
Philadelphia. Relative to the improvement of the harbor of	102	8
Springfield Armory. Report of expenditures and work of the	3	1
Wool. Report of the commissioners to select samples of, for use in the custom-houses. (Special Session)	3	8
World's Columbian Exposition. Report relative to the appropriation in aid of the	74	8

52D CONGRESS, 2d Session. } SENATE. { Ex. Doc. No. 65.

EIGHTH ANNUAL REPORT

OF THE

COMMISSIONER OF LABOR.

1892.

INDUSTRIAL EDUCATION.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1893.

CONTENTS.

	Page.
MESSAGE OF THE PRESIDENT	5
LETTER OF TRANSMITTAL	7-11
INTRODUCTION	13-19
CHAPTER I.—PRESENT STATUS OF INDUSTRIAL EDUCATION IN THE UNITED STATES	21-139
Manual training	24-79
Trade and technical schools	79-112
Agricultural colleges	112-131
Institutes of technology	132-139
CHAPTER II.—PRESENT STATUS OF INDUSTRIAL EDUCATION IN AUSTRIA	141-160
Manual training	143-148
Continuation and trade schools	148-160
CHAPTER III.—PRESENT STATUS OF INDUSTRIAL EDUCATION IN BELGIUM	161-216
The public school system	163-170
Manual training	164-170
Special, industrial, and technical schools	170-216
Apprenticeship schools	176, 177
Schools of agriculture and horticulture	177-179
Housekeeping schools for girls	179-182
Trade schools for girls	182-188
Parochial trade schools	188, 189
Trade schools founded by guilds and trades	189-193
Trade schools	193-198
Industrial schools	198-211
Drawing schools	212-214
Commercial institutes	214-216
Schools of industry and mines	216
CHAPTER IV.—PRESENT STATUS OF INDUSTRIAL EDUCATION IN FRANCE	217-302
The public school system	219-260
Infant schools	220, 221
Elementary primary schools	221-233
Advanced primary schools	233-243
Manual apprenticeship schools	243-260
Book work in relation to manual training	260
Education of a purely industrial character	260-302
Primary industrial schools	262-286
Secondary industrial schools	286-291
Superior industrial schools	291-297
Industrial art education	297-302
Travelling scholarships to graduates of industrial schools	302
CHAPTER V.—PRESENT STATUS OF INDUSTRIAL EDUCATION IN GERMANY	303-371
Manual training	305-328
Higher institutions for industrial education	328-336

CHAPTER V.—PRESENT STATUS OF INDUSTRIAL EDUCATION IN GERMANY—Concluded. Page.
Industrial trade schools and continuation schools in Prussia 336–350
Industrial trade schools and continuation schools in Saxony, Hamburg, and Bremen 350–362
Industrial trade schools and continuation schools in Bavaria 362–366
Industrial trade schools and continuation schools in Würtemberg 366–370
Alsace-Lorraine 371
CHAPTER VI.—PRESENT STATUS OF INDUSTRIAL EDUCATION IN GREAT BRITAIN 373–440
Beginning of the movement 375
Technical instruction acts 376, 377
Means of support of industrial education 377–384
National association for the promotion of technical education 384
Elementary manual instruction 384–386
Secondary and higher institutions 386–434
Results of technical education 434–437
Schools of agriculture 437–440
CHAPTER VII.—PRESENT STATUS OF INDUSTRIAL EDUCATION IN ITALY 441–457
CHAPTER VIII.—PRESENT STATUS OF INDUSTRIAL EDUCATION IN RUSSIA .. 459–483
Finland 464–469
Technical and trade education 470–479
Regulations for industrial schools 479–483
CHAPTER IX.—PRESENT STATUS OF INDUSTRIAL EDUCATION IN SCANDINAVIAN COUNTRIES 485–498
Manual training in Sweden 490–492
Manual training in Denmark 492–498
CHAPTER X.—PRESENT STATUS OF INDUSTRIAL EDUCATION IN SWITZERLAND . 499–586
National subsidies 501–505
Classification of schools 506
Kindergartens 506, 507
Manual training 507–509
Kindergartens and manual training, Geneva 509–513
Trade schools 513–568
Industrial art schools 568–571
Institutions for the education of working people 571–577
The Technikum, Winterthur 577–584
The Polytechnic school, Zurich 584–586
CHAPTER XI.—THE KINDERGARTEN IN RELATION TO MANUAL TRAINING 587–598
The public schools of Mont Clair, New Jersey 589–593
Public schools of the District of Columbia 593–598
CHAPTER XII.—MANUAL TRAINING IN CONJUNCTION WITH BOOK WORK 599–620
CHAPTER XIII.—MANUAL TRAINING AND TRADE INSTRUCTION IN REFORMATORIES 621–650
CHAPTER XIV.—THE EFFECT OF MANUAL TRAINING AND TRADE INSTRUCTION UPON THE INDIVIDUAL 651–662
Results of manual training schools 653–657
Results of trade schools 657–660
Training in sewing and cooking in the public schools of Philadelphia .. 660–662
CHAPTER XV.—BIBLIOGRAPHY 663–686

MESSAGE OF THE PRESIDENT.

To the Senate and House of Representatives:

I transmit herewith the Eighth Annual Report of the Commissioner of Labor. This report relates to industrial education in the United States and foreign countries.

BENJ. HARRISON.

EXECUTIVE MANSION,

Washington, D. C., February 8, 1893.

LETTER OF TRANSMITTAL.

DEPARTMENT OF LABOR,
Washington, D. C., February 7, 1893.

SIR: I have the honor to transmit herewith the Eighth Annual Report of the Commissioner of Labor, which report relates entirely to industrial education in its various forms in the United States and foreign countries.

In the act making appropriations for the legislative, executive, and judicial expenses of the government for the fiscal year ending June 30, 1891, under the appropriation for this Department, was the following item: "For the investigation of, and report upon, the various industrial school systems, and also technical school systems, of the United States and foreign countries, five thousand dollars." The plans which were adopted for the prosecution of the inquiry, indicated by this special clause in an appropriation act, comprehended a very wide and searching inquiry into the effects of manual training and trade instruction upon the individual, the intention being to ascertain where the graduates of manual training, trade, and technical schools, or those who have received partial courses in such schools, were employed, and from their surroundings and their employers to learn all the facts relative to their economic and moral condition. The schedule which was adopted for the collection of the desired information included inquiries concerning the age of the student workman, the various occupations he had followed, whether he had been trained conjointly by the study of books and the use of tools, his proficiency in the actual use of tools and materials relative to the proficiency of other workmen, whether he attained an average degree of skill and efficiency in the use of tools quicker than those who had not had manual or trade training, whether he had acquired greater economy in the use of materials than others, whether he is more proficient in the things that indicate mental cultivation—such as methods of work, planning, arranging, etc., his promise of becoming a more intelligent workman than those not receiving special training, his moral qualities relative to the average workman, his faculty for managing men, his interest in the welfare of the

establishment, whether he received greater compensation than that given to persons not coming from the technical schools, and various other general facts which would go to indicate the exact results of manual and trade training. The plan was to make this report the result of original inquiry, and it was expected that under the general powers of the Department, as outlined in its organic law, the investigation could be carried beyond the cost stated in the act quoted. Under a former ruling of the accounting officers of the treasury department, this expectation was justified. But after the work was well under way a new ruling was made (and I believe a proper one), which limited the Department in this particular investigation to the sum of $5,000. Originally, the intention was to give most prominence to the chapters on manual training in conjunction with book work, the kindergarten in relation to manual training, manual training and trade instruction in reformatories, and the effect of industrial education upon individuals as shown by special investigation. All these subjects were to have been the result of original inquiry, and the material drawn from other sources was to have been subordinated to the Department's own efforts. The treasury ruling referred to made a reversal of this plan necessary. The chapters relating to the present status of industrial education in this and other countries have been made most prominent, and those giving the results of original inquiry the least so, although perhaps the more important part of this report. The chapters on the present condition of industrial education, while they are to a considerable extent the results of careful compilation, could not have been made as comprehensive as they are without the original work of the experts of the Department. In making the general chapters only the most trustworthy information has been accepted. This change of the plans of the Department results in a report which may appear in some respects to duplicate matter published by the bureau of education under the title of Industrial and Manual Training in Public Schools in the United States, being Part II of the work on Art and Industry. This exhaustive volume, prepared by Dr. Isaac Edwards Clarke, of the bureau of education, comes to me after this report is ready for the press. A careful examination of it shows that the two reports practically supplement each other, and that they do not to any considerable extent cover similar lines. The report of the bureau of education enters more largely into historical matter and into the theory of industrial education from the standpoint of the teacher. Our own, so far as the chapters

on education in the United States and foreign countries are concerned, gives condensed statements of the exact status of different institutions for manual training and industrial instruction, while, of course, the original matter in the other chapters is not canvassed at all in the document just published by the bureau of education. Where the reports touch most closely is in what each has to say concerning what has actually been done in some American cities. Otherwise, as stated, the reports are supplemental each to the other, and the fact that they reach widely different constituencies renders the little duplication occurring of no practical importance.

In its original work the Department has been fortunate in securing the assistance of men not generally employed by it. Through the kindness of the honorable secretary of war, the Department was able to avail itself of the services of Lieut. Henry T. Allen, second United States cavalry, military attaché of the United States legation at Saint Petersburg, and the services of Mr. Charles W. Hills, of the quartermaster general's department. Through the courtesy of the honorable secretary of the treasury, Mr. J. Fred. Meyers, a gentleman thoroughly acquainted with the German language and Germany, and greatly interested in the cause of industrial education, gave his services to the Department in connection with our inquiries in Germany. Dr. Henry H. Belfield, the director of the Chicago Manual Training School, was of great service to the Department in ascertaining the results of manual training in connection with book work. Dr. Homer T. Fuller, of the Worcester Polytechnic Institute, contributed important material in explanation of the so-called Russian method of manual training. Dr. Azel Ames, jr., of Boston, temporarily residing in London, furnished the Department with a valuable preliminary report on industrial education in Great Britain, which greatly assisted our experts in prosecuting their special inquiries. Mr. John Koren, a gentleman thoroughly conversant with the Scandinavian languages and familiar with the habits and customs of the people of Norway, Sweden, and Denmark, rendered efficient service in the Department's inquiries in those countries. The valuable services of all these gentlemen were secured at a minimum cost through their patriotic endeavor to assist in so important an inquiry as that relating to industrial education. Their labors were supplemented by various members of the regular force of the Department.

The tabulations have been carried out under the direction of the chief clerk, Mr. Oren W. Weaver, and by Mr. G. Wallace W. Hanger,

of this Department, who has general charge of the tabulating force. To these gentlemen and the members of the force assisting in the production of this report, I am under great obligation. Especially do I wish to thank Dr. William H. Rand, of this office, who has had special charge of the compilation of all material not resulting from the original work of the Department, and Mr. Charles H. Verrill, who has been engaged in the revision of the report. I am also under special obligation to Hon. Horace G. Wadlin, chief of the bureau of statistics of labor of Massachusetts.

In addition to this regular annual report of the Department there have been prepared two special reports, one relating to the compulsory insurance laws of Germany and the other to the Gothenburg system of liquor traffic, while an investigation relating to the housing of labor in different countries is in prosecution. A portion of the force has also been engaged upon the collection of data relative to the phosphate industry of the United States, in accordance with a resolution of the Senate. Much time has also been occupied in completing and perfecting the Department's share in the work of the Senate committee on finance, especially in relation to wholesale prices and wages for the period from 1840 to 1891, inclusive, and for the supplementary period including October 1892. This report of the Senate finance committee, contemporaneous with this annual report of the Department, is an exceedingly important one, giving as it does the rates of wages paid in leading industries for the long period named. All these rates of wages, in accordance with the general practice of this Department, have been collected from the actual payrolls, and not from statements made to the Department. Access has been obtained in nearly all cases to the payrolls themselves, and transcriptions made therefrom for use in tabulation and in classification. The collection of data, therefore, is most trustworthy in following the rates of wages from 1840 down to the present time. The Department also prepared for the committee on interstate and foreign commerce of the House of Representatives a compilation of the labor laws of the various states and territories and the District of Columbia, which compilation accompanied a report submitted by Hon. John J. O'Neill, of that committee, July 20, 1892, and has since been printed. It is a work of about six hundred pages, giving quite *in extenso* the specific labor laws of all the states that had been enacted up to and including the legislative sessions of the different states for the year 1890–'91.

In the Seventh Annual Report I called attention to a provision in the organic law of the Department relating to the establishment of a system of reports by which, at intervals of not less than two years, the general condition, so far as production is concerned, of the leading industries of the country could be reported. The object of this provision of law was to secure information at brief intervals concerning the volume of production of the country, so that conclusions might be drawn as to whether production was increasing or decreasing, and in either case as to what leading industries were more especially affected. The provision of law cited could not be carried out except by thorough coöperation with the census office, because the statistics of manufactures for 1890 must furnish the basis for any such system. During the past summer an attempt was made to establish the system indicated by law, and to this end the superintendent of census heartily coöperated with this Department. It was soon found, however, that the means at the disposal of the Department of Labor were quite inadequate to the carrying out of the provision of the organic law. Furthermore, the question of the establishment of a permanent census office had been raised by Congress, and the proper committees were considering the propriety of creating a permanent census bureau. These two reasons—a lack of means and the prospect of a permanent census office—caused me to suspend the preliminary labors necessary for the establishment of the system of reports provided for in the organic law of the Department. Should a permanent census office be established this work would be more especially its duty than that of this office.

I am, very respectfully, your obedient servant,

CARROLL D. WRIGHT,
Commissioner.

The PRESIDENT.

INTRODUCTION.

INTRODUCTION.

The investigation, the results of which are summarized in the following pages, was undertaken by this Department, pursuant to an act of Congress appropriating $5,000 "for the investigation of, and report upon, the various industrial school systems, and also technical school systems, of the United States and foreign countries."

The terms of this act have been construed to include the systems of manual training, of apprenticeship, and of technical instruction, in vogue in the several classes of special schools as well as the public schools, at home and abroad; and the Department has endeavored to execute its commission with full fidelity, so far as the limitation imposed by the amount of the appropriation would permit.

The object kept steadily in view throughout this inquiry has been to compare foreign systems of industrial education with our own, and by this means to obtain from the older civilization of Europe some useful hints for the improvement of American schools; but above all, to ascertain the precise effects of manual and technical training upon local and national industries, upon the pupil, upon the quality of his work, his capacity for wage earning, his value to his employer, etc.

To define some of the terms which will frequently recur in this report, it may be said that manual training signifies instruction in tool work as an educational discipline. This definition distinguishes and differentiates it from trade school teaching, the sole or primary aim of which is to give the apprentice a thorough and practical knowledge of some handicraft. It is true, the apprentice may incidentally acquire much general information in a trade school; but education is not the main end sought in the apprenticeship school, whereas in the manual training school it is the paramount object. The difference may be illustrated by contrasting the course pursued in the New York Trade Schools, for example, with that of the Saint Louis Manual Training School. In one, the course is of short duration, and is limited to a severe drill in the theory and practice of a trade. The course in the other lasts three years, comprising high school studies, with manual practice in wood and iron work as a coördinate branch of education.

The technical school is a high grade trade school, or a school in which, while a craft is taught, the scientific principles upon which it is grounded are also fully explained and demonstrated in their applications to art and industry. Schools of this class are the weaving schools of Philadelphia, Crefeld, Glasgow, Berlin, etc.

Institutes of technology are of university rank, and their courses of study lead to a professional degree, generally to that of civil, mining, or electrical engineer. To this grade belong the Massachusetts Institute of Technology, the Rensselaer Polytechnic Institute, the Worcester Polytechnic Institute, the Stevens Institute of Technology, etc.

Manual training is of modern origin. For while many theorists and scholars during the past four hundred years have declared themselves in favor of such instruction, and while some fitful attempts had been made at intervals to incorporate manual labor with scholastic education in isolated instances, it was not until the year 1860 that a man of sufficient courage and force of character appeared and undertook to reconstruct the educational system of his native land in accordance with the principles of Pestalozzi and Froebel. This was Uno Cygnaeus, of the Helsingfors Teachers' Seminary, who, after long and diligent study of Swiss and German educational authorities, devised an advanced system of manual exercises adapted to pupils beyond the kindergarten age. This is sometimes called the Russian system of tool instruction, though the term Russian system is now generally used to designate that plan of shop instruction under which the pupil produces no finished article, but merely makes component parts of an object, or manipulates the material used, as an educational exercise.

The so-called Russian method of manual training, whether practised in apprentice schools, or trade schools, or in technical schools, is really a misnomer, for there is no one method exclusively in vogue in Russia, either for the training of artisans or for purposes of education for superintendence. Take, for example, the two largest technical schools in the empire, one at Saint Petersburg and the other at Moscow. In the former the course of theoretical training, including drawing, covers four years, then in the mechanical department there is an additional year which is devoted almost solely to shop practice. This embraces a brief course in wood work, iron filing and chipping, use of lathes and planes and other machine tools, and a slight amount of forging. But here there is no aim to construct a machine for actual use. A few have been erected for illustration and these are in the museum of the institute. The purpose here is purely to educate, and the form and finish of the product, as judged by the eye or estimated by the calipers, is the objective result.

On the contrary, the whole plan of the corresponding department of the Moscow Technical Institute is quite different. The course is six years long. During the first year there is given about thirty hours weekly of instruction in mathematics, physics, and free-hand and mechanical drawing. In the second year fifteen hours weekly are devoted to recitations, lectures, and drawing, while eighteen hours weekly are given to shop work, viz., six to carpentry, six to wood turning, and six to lathe work in metals. Very little time is given to bench work in metals, very much to the use of machines. In the third year twelve

hours weekly are alloted to practical work, this being chiefly the construction of locks, the manufacture of which involves the use of both machine and hand tools. A part of the students may employ the practice time of this year in pattern work. In the fourth year twelve hours weekly are employed in shop work. The construction of locks or pattern work is continued, and about half the time is equally divided between forging and foundery work. In the fifth year the students work twelve hours weekly in the machine shop, and become accustomed to manage all the machines used in any ordinary shop. In this machine shop, besides the 40 to 60 students in each class, there are about 35 journeymen, and the purpose is to manufacture a great variety of articles for sale. So in the foundery 30 journeyman workmen are employed and a great deal of job work and government work is executed. During the last year considerable time is given to designing machinery and to excursions to manufactories in the city.

What Prof. Runkle calls the Russian method is essentially the method of the Saint Petersburg Institute of Technology and of the Novgorod School, an exhibit of the work of which is made at the Chicago exposition. This is the method adopted in shops of the Massachusetts Institute of Technology at Boston. But the Moscow method differs from the former in three respects: First, the practice is distributed over five years' time instead of being all crowded into one year; second, it is much more largely machine work rather than bench work with hand tools; third, as much as possible of the practical work is done with a view to the use and sale of the products. The Moscow method is best represented in this country by the shop work of the Worcester Polytechnic Institute, though the latter school carries the idea of construction for use still farther. This method might almost as properly be called Russian as the other.

From Finland the educational reform extended to Sweden and all Scandinavian countries, and thence to the whole world. In adopting the new method, however, each nation has given to it a distinctive name. In Sweden it is known as sloid; in Germany, manual dexterity, though instead of this term many German writers now use the name adopted by the Strasburg congress, viz., workshop instruction; in France, manual labor; in the United States, manual training, etc. The one characteristic common to all these systems is that the manual work subserves a purely educational purpose. As M. Salomon says of sloid, it is to be used in the service of the school, not that the school should be subordinated to sloid. Swedish sloid, by the way, as expounded by the principal of the Nääs Seminary, consists mainly of wood carving and simple cabinetmaking. A series of one hundred models is placed before the pupil and he is taught how to reproduce each of them with hand tools. The Nääs Seminary, however, does not represent all phases of so-called sloid systems, but only one. The Swedish models do not satisfy the æsthetic tastes of all nations.

The Belgian people, for example, while employing what they call a sloid system in their schools, reject the sloid models of Sweden as uncouth, and make use of an entirely different set of their own invention. Denmark, too, has adopted sloid into her educational system. But, as may be seen from the detailed description of Danish sloid by Prof. Mikkelsen, there is but a slight resemblance between its methods and those in vogue in Sweden. In Scandinavia wood sloid prevails, but metal sloid and polysloid systems exist elsewhere. There is, therefore, no single sloid system, but there are many systems of sloid. It must never be forgotten that the mode of educational organization in Europe differs widely from that of the United States. In several continental states, for example, a manual training system is established by law and the schools themselves are aided by direct subventions from the government. The same thing is true of trade and technical schools also. With us, on the contrary, whenever public manual training schools are founded, the work is usually done by local boards, by municipal authority, or by private enterprise, and the undertaking assumes the character of a tentative experiment. Hence, we have no uniform system of manual training in this country, but only a number of independent, heterogeneous ventures, some of which, however, have already demonstrated their right to exist.

But there are several incorporated manual training schools in the United States which surpass anything of the kind to be found abroad. In these, something more is taught than the use of mere hand tools. Machine tools for wood and metal work abound, and the colossal mechanical appliances for testing the strength of materials, etc., (to be seen in the Chicago, Saint Louis, Toledo, and Philadelphia schools) dwarf into insignificance the relatively meagre equipments of the foreign schools of this class. In short, Europe has nothing in the nature of a manual training school equal to any of these great American institutions; nor has the Old World a single institute of technology that can bear comparison with the best of our own.

In respect to technical and trade schools the conditions are, with a few exceptions, exactly reversed. There is nothing more admirable than the European systems of trade and technical teaching. Their thoroughness is proverbial, and the specialization of their training comprehends the minutest details. The German *Fachschule*, where a single specialty is taught—upholstering, for example—turns out, at the end of the course, a thoroughly competent workman. The dyer who learns his art in the Crefeld laboratories is versed in all the subtile chemistry of colors; and, from his knowledge of the composition of fabrics, understands how to compute, to the fraction of a pfennig, the cost of dyeing a given number of yards blue or yellow.

A like thoroughness characterizes the instruction given in the horological schools at Besançon, Geneva, and Coventry, great centres of the watchmaking industry. It is a distinguishing feature, also, of the pro-

fessional schools of tailoring, dressmaking, and artificial flower making in France, Belgium, and Switzerland; of the Austrian wood carving and cabinetmaking schools; of the German schools for locksmiths and horseshoers; and even of the fishing schools of the Scandinavian peninsula.

In the fishing school, for example, the topography of the coast-line is minutely taught by means of charts and maritime excursions, and the youth becomes as well acquainted with every headland and bay of his native country as with the physiognomy of his teacher. He studies the tides, winds, and currents. He is made full sailor. He learns the habits of fishes, the season for catching, the proper bait for different species, the best methods of curing his catch and preparing it for market. Besides all this, he acquires a knowledge of French and English nautical and commercial terms, and familiarizes himself with the prices current of various lands. His training, if not equal to a liberal education, is an excellent preparation for his vocation in life.

A few of the trade and technical schools of the United States take rank with their European prototypes. Of these, the New York Trade Schools, the Pratt Institute, the textile department of the Pennsylvania Museum and School of Industrial Art, and the New York Institute for Artist-Artisans are examples. But the most of our schools of this class are far inferior, in respect to the fulness and completeness of their teaching, to the foreign models.

Yet, in our half-developed state colleges of agriculture and the mechanic arts we have the foundation for a better system of technical instruction than exists anywhere today; and in the establishment of such noble institutions as the Drexel Institute, the Williamson Free School of Mechanical Trades, the Armour Institute, etc., one may discern the promise of future American primacy in the industrial arts.

However, it is not with the prospective, but with the present condition and effects of industrial education that we now have to do; and we purpose to consider this subject in the following chapters.

In considering the subject of the present status of industrial training in the succeeding chapters, no attempt has been made to take a census of the various institutions in this and other countries in which industrial training in any form constitutes a feature. At the present time the number of institutions equipped for manual and trade training is of no great consequence. It is rather the organization and methods of representative schools which are something more than experiments that we wish to know. The chief object, therefore, has been to draw from original and other sources the facts which should most clearly show the actual progress which has been made relative to the introduction and prosecution of studies in manual training and in trade schools, and their influence on the individual. Only those sources which are considered most authentic have been used to supplement the original inquiries of the Department.

CHAPTER I.

PRESENT STATUS OF INDUSTRIAL EDUCATION IN THE UNITED STATES.

CHAPTER I.

PRESENT STATUS OF INDUSTRIAL EDUCATION IN THE UNITED STATES.

The present status of the industrial education movement in the United States is peculiar. Perhaps not more so, however, than its development from its inception. It is one outcome of the feeling of dissatisfaction with the older methods of education and the effort to make public education more practical. The same feeling has manifested itself in the reform of the college course by reducing the amount of classical study required, by the introduction of elective courses, the adoption of the seminary method, and the extension of the laboratory method in scientific study. As far as industrial education is concerned, this movement made its beginning and has reached its highest development in schools of a scientific or technological character. These schools, the first of which is only about thirty years old, now rank in their kind with any in the world, and taken all in all, as educational institutions, they are of equal rank with the best universities. From these schools the movement has extended through the agricultural colleges until it has reached, and is now transforming, the methods of instruction in the public schools. Its immediate influence on the public schools has in many instances been through schools established by private enterprise for manual education. The success of these experiments has determined the fate of the new education. Some of the larger public schools have carried the experiment to success and have been eagerly followed in the work by the more ambitious of the smaller ones. Several states have indorsed the movement by appropriations and others by legislation permitting its adoption in public schools.

The schools which would properly be included in any consideration of the subject of industrial education differ very much in character. From the school which aims to give the pupil simple educational exercises in drawing, modelling, and wood working, to the schools which turn out the skilled designer, dyer, or mechanical engineer, is a long step. Between these two extremes are schools of various grades and characters. To present all these without some attempt at classification would give but a confused idea of the progress that has been made by the industrial movement in education. The line of demarcation between schools of such various aims and methods as those considered is not sharply drawn; but we could hardly expect to find it otherwise. Many of the courses of instruction offered by the schools are confessedly experimental and

quite naturally follow widely different lines. Manual training, simply as an educational feature, is found more commonly in courses of the grammar and high school grades. The best schools are not all, however, under public management. Some of the earliest schools were established, and are still successfully carried on, entirely by private enterprise. The simple exercises in drawing, modelling, and wood working, which have characterized the beginnings in some of the public schools, are quite different from such complex courses as are offered in the Saint Louis, Chicago, or Baltimore manual training schools. Some of the higher grade schools, too, of more complex organization will be found with departments that might be classed as strictly manual training, while having also the technological department. The line between the trade and technical schools will in some cases be more difficult of definition. The so-called trade schools may be said, in general, to train apprentices, while the technical schools turn out men thoroughly instructed and trained in all that science as well as manual skill has accomplished. Any classification that might have been made would be arbitrary and probably open to criticism. The classification that has been adopted had for its aim the bringing together of schools of the same general purposes and character. It was thought that a much clearer idea could thus be gained of what has been accomplished along the different lines followed by the various schools.

As presented in this chapter the schools are separable into four classes, viz., manual training schools, trade and technical schools, agricultural colleges, and institutes of technology.

MANUAL TRAINING.

Manual training in the public schools will be found to have been more often the subject of experiment in the northeastern states, perhaps, than anywhere else. Massachusetts, New Jersey, and New York seem to have led in the number of experiments, though it certainly can not be said that any single one of these experiments, or the results attained by any one, overshadows in importance those that have been made in Baltimore, Chicago, Omaha, Philadelphia, or Toledo. But in these states the movement seems to have made more progress in the smaller cities and towns. In New Jersey the reason is clear. The encouragement which the state has officially given by duplicating any sum between $500 and $5,000 which might be subscribed or appropriated has tempted some of the smaller places to give the work a trial where it probably would not have been thought of without the state's offer. In several other states there has been state action in the line of permissive legislation—either authorizing taxation or allowing school boards to take measures to incorporate manual training with the branches already taught in the public schools. So that whatever may have been done in these states is the result of local legislation and may be assumed to represent local sentiment. It may probably be said, too, that if the

manual training instruction has been retained in most of these places, it has been from a feeling of satisfaction with the results of the trial.

In the South different conditions prevail. But here, too, the movement has made a good deal of progress. The industrial element has been incorporated in very many of the schools established for the benefit of the colored people. These schools are not generally of a public character, though in many cases the state has freely voted funds for their support. The expenses of attendance are small, however, and frequently tuition can be obtained free of charge. The schools usually offer instruction for all grades from the preparatory to the theological student. The normal and agricultural courses will be found prominent features. The John F. Slater fund divides its income of about $45,000 among forty-four different schools for the colored race. The fund as now administered is doing much to advance the cause of industrial training. Whatever the result of this training upon the graduates, it offers, under the plans adopted in many schools, the opportunity to the students of paying in great part the expenses of their education in work. Generally it is not possible to point to positive results of the industrial training upon the occupations of the graduates. The demand for teachers and ministers of the colored race all over the South seems to take up nearly all the better and more proficient of the graduates.

In the adaptation and application of manual training principles to the needs of different schools, it often happens that the methods and extent of the work are greatly modified by varying local conditions. The public schools, for example, in whose curricula the new discipline is tentatively incorporated, can not, as a rule, carry it much beyond the elementary exercises of drawing, modelling in clay, and the simple manipulations of carpentry, with plain sewing and cooking. The expense of equipment and the cost of maintenance (to say nothing of its inexpediency from an educational point of view) forbid the further extension of the experiment, at least, outside the larger cities. Thus, in the public schools of Somerville, Massachusetts, sewing is the sole branch of manual training; in the high school at Albany, New York, wood work and sewing are taught; while in the Philadelphia Manual Training School, drawing, clay modelling, and tool instruction comprise the whole of this special instruction.

In the great incorporated manual training schools like those at Chicago and Saint Louis, on the other hand, a more thorough course is pursued, including carpentry, wood turning, patternmaking, cabinet work, foundery work, forging, machine shop work, etc. The methods of teaching adopted in these institutions are analogous to those in vogue in institutions of technology and other professional schools where the student acquires a knowledge of science not from text-books merely, but from a severe course of practice and experimentation in the laboratory.

A glance at some of the ways in which manual training has been

supported in the public schools may prove interesting and instructive. In Jamestown, New York, where a beginning was made as early as 1874, the funds were for a long time raised by subscription and by exhibitions given by the students. Even now, though the city makes an appropriation, much of the money is raised in this way. In Hoboken, New Jersey, public spirit has been at the back of the movement. An organization of the citizens—the Hoboken Industrial Association—started the movement, and, while both the state and city have joined in the support, has continued in the management. The state of New Jersey, as already noted, has for several years generously shared with any town or city complying with certain conditions in the support of manual training. At Toledo the manual training school was a gift to the city. At Baltimore the city has from the first borne all the expense.

The ways in which the public schools offering manual training distribute their benefits are various. For not in all the schools does every pupil receive the benefits of the training. On the contrary, the custom would seem to be more frequently the other way. In Baltimore, for example, the manual training course is a distinct high school course which the pupil must choose as he would choose the English or the classical course. This plan has come to be a favorite one in the organization of manual training high schools in the larger cities. In Omaha, on the other hand, the manual training is an exercise which may be taken by high school pupils in addition to the regular studies. Going to Jamestown again, we find the training offered to certain selected students below the high school only, while at Mont Clair, New Jersey, the manual training work is introduced in some way to all the grades from the lowest up to, not into, the high school. Washington goes a step farther than Mont Clair and offers manual training as an elective to high school students. The plans in operation in the Washington schools provide for what is probably the most complete of the systems of manual training in the public schools.

Many schools described in the succeeding pages as institutions of manual training are, to a certain extent, schools of apprenticeship, though the brief courses pursued in them seem wholly inadequate for the mastery of any trade. Of course the scope of its training determines the rank and the category to which a school belongs, for it is the grade of work done by a school or college, and not the title that it bears, that indicates its relative educational position; and, judged by this standard, many so-called technical and trade schools gravitate to the manual training level.

ALABAMA.

The Emerson Institute at Mobile, an institution for the freedmen in the South, under the care of the American Missionary Association, has an obligatory manual training course of wood work for boys and of

sewing and cooking for girls. In the wood working department it is the end and aim to have pupils become acquainted with all the ordinary tools of carpentry, to give them a general knowledge of wood working principles, and to afford them the best possible training by practice. In sewing the same object is kept in view. Regular instruction in all kinds of plain sewing is given to girls of all grades up to the seventh year.

At Talladega College manual training holds a prominent place in the school work. The training for boys begins with the third and fourth grades by instruction in knife work. This is preparatory to the work which may be regarded as more distinctly industrial—carpentry, which extends through the fifth, sixth, seventh, and eighth grades. In the ninth grade mechanical drawing is introduced. In the tenth grade instruction is given in agriculture and horticulture.

For the girls a graded course of instruction in sewing, cooking, etc., is arranged. The course begins with plain needlework in the third grade and extends through the seventh grade including the cutting and fitting of garments. Cooking is taken up during the eighth grade. During the ninth and tenth grades there is instruction in nursing, with special study in hygiene.

The Tuskegee Normal and Industrial Institute, a school for training colored young men and women, at Tuskegee, was established by an act of the Alabama legislature in 1880. Its beginning was made in a church, July 4, 1881, with 30 students and 1 teacher. The school now occupies several substantial buildings and owns 1,400 acres of land. In the tenth year (1890–'91) from its foundation it had 31 officers and teachers, and, including the training school, an enrolment of 731 students, representing 13 states.

The state has from the first contributed to the funds of the school. The appropriation of $2,000, annually made for the support of the institution, was increased by the session of 1883 to $3,000 annually. All of this appropriation is used to pay tuition.

The work of the school includes a preparatory course of three years and a normal course of four years. The agricultural and mechanical work is carried on in connection with the normal course, which is designed to give a thorough English education. The course as planned has for its object "to teach the dignity of labor; to teach the students how to work, giving them a trade when best; and to enable students to pay a portion of their expenses in labor." In accordance with this plan work is required of all students.

On the school farms a special effort is made to give the students lessons in practical farming. The work not only furnishes valuable employment to the students but supplies largely the demands of the school. There is a brickyard and a saw and planing mill in connection with the farms. All the buildings on the school grounds have been erected by students' labor. The bricks were made by them, and the

lumber was sawed and worked up by them. In addition to this, bricks and lumber are sold and made to contribute to the funds of the school.

Carpentry is also a branch of work taught and practised in the school. Much of the furniture used in the school as beds, tables, benches, wardrobes, etc., has been manufactured in the shop of the school. In this connection painting is also taught.

A well furnished printing office offers instruction and practice in job and book work. All of the printing needed by the school is done here, as well as much job work from which an income is derived. Some instruction is also given in blacksmithing, tinsmithing, shoemaking, and harness making.

For the girls a sewing room and a well equipped laundry furnish opportunities for instruction in their respective departments. Here many articles are made for sale to the students, and in the laundry the work of the school is done.

This school is a type of a large class in the South. The characteristic feature of the class is the combination of manual work and book work with an educational aim, the manual work contributing at the same time to the equipment and maintenance of the school and to the payment of the expenses of the students.

CALIFORNIA.

At Oakland a manual training department, in connection with the public schools, was inaugurated in 1890.

The Cogswell Polytechnic College of San Francisco is an institution of high school grade, according to the report of its president, with a department of manual training. The president, writing under date of August 7, 1891, says:

> Only the carpenter shop, blacksmith shop, modelling and carving rooms are in operation now, in addition to the drawing and high school course of studies. The first class was graduated in May last, so that the time is evidently too short in which to test the value of their training, and they will hardly represent what we expect to accomplish when all departments are in working order.

There were 21 graduates in 1891, 14 girls and 7 boys.

CONNECTICUT.

In the Normal Training School of New Britain all the classes are trained in the sloid system of wood work. Scholars of the model schools are also instructed in the use of tools, and practice regularly in the workshop. The kindergarten department of this school does a related but independent work in training kindergartners.

In the public schools of New Haven a systematic course of lessons in carpentry, cooking, and sewing is given. Instruction was commenced November 1, 1886, and since that time 10 classes of 24 boys each, mak-

ing one class from each grammar school, have received two hours' instruction each week. Drawing, modelling in clay, and construction work with paper and pasteboard for materials, as taught in the primary grades, are the branches taken up.

FLORIDA.

The Florida state superintendent of public instruction, writing in 1888, stated:

Many of the principal schools in the cities and towns have introduced the ordinary tools of the trades, and placed a bench and table in the building, and pupils are being made familiar with their use. This is our beginning; we hope to press it to the front until we shall make our system of public education thoroughly practical. In our normal schools (state) we are training our teachers of both races for this work.

At Jacksonville, in 1887, manual training was introduced in the colored graded schools, with 60 boys and 58 girls in attendance. The work of instruction was begun in a two-story building, the lower floor being occupied by the boys, the upper by the girls. This school receives $1,000 a year from the income of the Slater fund.

GEORGIA.

At the Atlanta University a three years' course of mechanics, consisting of work in wood and iron, is laid out for all students. Seven and a half hours a week are given to this work during the course. In the first year the use of tools and the general principles of wood working—mortising, tenoning, dovetailing, etc., the measuring of lumber, and kindred manipulations are taught. In the second year this course is continued and extended, and wood turning, patternmaking, and mechanical drawing are taken up. The use and care of the blacksmith's forge and tools, the principles of forging, the tempering of steel, etc., are learned in the third year. Boys in this college, and in its preparatory and normal departments, not only take the above course, but they are also taught the principles of farming and gardening. Besides, an outfit of type and a printing press now belong to the equipment of this department, and the printer's art will be among the subjects taught.

The building used by this department was put up in 1884. It is of brick, 100 by 44 feet, and three stories high. It is divided into suitable rooms fitted up for the several branches of the mechanic arts. One room is furnished with 30 cabinet benches, each supplied with a full set of tools. In another room are 12 wood turning lathes run by steam. A forge room has been added and 12 forges and anvils are in use. Another room is used for mechanical drawing. The furniture in this room was made by the students.

For several years various forms of manual training have been in vogue at the University of Georgia. Quite recently (1888) a department of

mechanical engineering has been organized, and under the title Georgia School of Technology has taken a place in the first rank among the most promising schools of the new South.

It has been equipped with machinery and tools from the best makers and of the latest patterns at a cost of over $20,000. The two-story brick workshop of the school is 250 feet long by 80 feet wide. The shops of the institution have already won an enviable reputation for the quality of their iron and brass castings, perfection in gear-cutting, and the beauty and variety of their wood and other work. These shops are self-supporting, and in addition contribute to the general expenses of the other buildings. The leading object of the school is to teach the principles of science, especially those which relate to the mechanic and industrial arts.

The school offers an education of a high grade, founded on mathematics, the English language, the physical sciences, and drawing, while it gives such familiarity with some industrial pursuits as will enable the graduate to earn a living.

To be admitted to this school, students must be 16 years old and show proficiency in elementary English branches. Tuition is free to residents of Georgia; but a charge of $150 is made against non-residents of the state. Every student must take the full course as prescribed; there is no elective course.

Lectures, recitations, and practice are the means of instruction. The course lasts four years and consists of the following studies:

First year.—Algebra and geometry; free-hand, linear, and instrumental linear drawing, perspective sketching, and orthographic and isometric projection; advanced grammar, readings, and essays; shopwork, including wood work, with elementary instruction in laying out work, the use of ordinary hand tools, pattern and cabinet work, and the use and care of wood working machinery.

Second year.—Solid geometry completed, plane and spherical trigonometry, levelling, topography, surveying, and field practice in compass and transit surveying; descriptive geometry, shades and shadows, and machine drawings to scale; rhetoric, readings, and essays; physics, including general properties of matter, motion and machines, hydrostatics, pneumatics, and acoustics; general chemistry—non-metals, metals, and lectures on technical subjects; shop work, including iron work, the simpler lathe operations, the ordinary operations performed with engine and speed lathes, upright drill, planer and shaper, and turret-head screw machine, the simpler kinds of bench work, and practice in the foundery in moulding and pouring iron and brass.

Third year.—Analytical geometry, field practice in plane table surveying, calculus, and map work; drawing—spur, bevel, and worm gearing, and machine designing; science of rhetoric, political economy, science of government, readings, and essays; engineering—kinematics,

mechanism, materials, and machine design; physics, including magnetism and electricity, heat and light; chemistry, including metallurgy, useful metals, and qualitative analysis; physiographic, lithological, and historical geology; shop work—practice in the more complicated operations with the lathe and planer, in the use of the universal milling machine, and in gear cutting, tool making, the care of boilers and engine, and foundery practice.

Fourth year.—Calculus; special problems in designing machinery and graduate work in machine design; English literature, criticism, readings, original speeches; engineering, analytical mechanics, machine design, applied mechanics, steam engineering and prime movers, laboratory experiments; physics—laboratory work; organic chemistry, historical and dynamical geology; shop work, including the building of one or more machines, engineering and planing work, assembling, erecting, and starting new machinery, making drawings and designing tools and fixtures to be built in the shop.

There are also at Atlanta two colleges for colored students, with workshops and a limited amount of manual training. It was not possible, however, to find any students who had attended these schools employed in actual manual work. The demand for teachers of the colored race all over the South seems to take up all the better and more proficient ones.

In Clark University at Atlanta, blacksmithing, carpentry, carriage making, wagon making, painting, harness making, shoemaking, printing, and draughting are all taught. There was about $15,000 worth of work sold out of the shops in the year 1890–'91. A special course in the trade school has been introduced whereby a student with an English education can devote all his time to the trade school, thus completing his trade in a short period of time. Housework, dressmaking, and needlework are taught to young lady students. In 1890–'91, 75 boys were enrolled in the trade school. The catalogue of 1891–'92 indicates continued prosperity in this department of Clark University.

Spelman Seminary, Atlanta, is an institute for women and girls, with an industrial department as a prominent feature. The manual branches taught are housekeeping, cooking, washing and ironing, sewing, dressmaking, and printing. The teachers are all females, and in the industrial department there is a special teacher in each of the following branches: Printing, dress cutting and making, sewing, laundry work, and domestic arts. In the aggregate there were 515 students engaged in these specialties in this school in 1891.

There was also a nurse training department, with two teachers and 57 pupils in 1891. The course of instruction in this department extends through three years, and is most practical and thorough. The authorities say, "We are unable to supply the calls for nurses from physicians in the city who have had our nurses care for their patients."

The state has recently made provision for a girls' industrial training school, giving the old capitol grounds at Milledgeville and liberal appropriations.

ILLINOIS.

In the state of Illinois manual training has a place in the public schools of several cities.

At Beardstown boys from the seventh and eighth grades have the option of pursuing shop work. In 1887 a basement room was fitted up for this work, and furnished with benches and wood working tools. The course of shop work is designed to occupy two years' time, each class averaging two and one-half hours per week.

The only items of special interest relating to this movement are the cost of the plant and the current expenses. These are given as follows:

Six cabinet benches	$100
Twelve sets of tools	50
Tools for general use	15
Fixtures and furniture	25
Incidentals	10
	200

The annual cost of carrying on the work is, in detail: Instruction, $250; materials, $25; repairs, $15; incidentals, $10; total, $300.

Among the foremost of the schools of its class in America is the Chicago Manual Training School. This institution may be taken as a fair representative of its class. The course of instruction is far from superficial, nor is it devoid of the humanities. In mathematics, science, and drawing it takes a wide range. The course of study and practice extends over three years. It is not necessary to speak in detail concerning the thoroughness of the instruction given. It is essentially the same in amount and in character as the course of the Saint Louis school, very fully described in another place. It is sufficient to say that graduates of this school are admitted without examination and free of conditions to the School of Mechanical Engineering of Purdue University, the Polytechnic School of Washington University, Sibley College of Cornell University, Rose Polytechnic Institute, Colleges of Agriculture, Engineering, and Natural Science of the University of Illinois, and the University of Michigan. This fact is cited merely to show the standing of the school, and the esteem in which it is held by higher educational institutions. It indicates, too, something positive in regard to the amount of academic work accomplished in the course of the school.

The school has been growing constantly since its opening in February 1884. The equipment has been increased from time to time, and in 1890 the building was considerably enlarged to meet pressing demands. The school has been obliged to refuse admission to applicants for want of sufficient room. The list of instructors for the year 1891–'92 numbered thirteen. For the same school year the number of pupils enrolled was as follows:

Junior class	156
Middle class	108
Senior class	71
Postgraduates	4
Total	339

The tuition fees charged are $80, $100, and $120 for the first, second, and third years, respectively. The annual deficit is made up by the Commercial Club of Chicago, the founder and owner of the school. Deserving boys who are prepared for the school are frequently admitted without payment of fees.

It should not be overlooked that "education, not manufacture, is the idea underlying the manual training" given in this and in all other schools of the class; and it is the educational, not the commercial, value of the training which is most prized. The committee on annual exhibit of drawings at this school said of the work:

Your committee is especially pleased to notice the attention given to free-hand drawing, believing, as it does, that the ability of the workman to use his pencil freely in the expression of his thought is an important factor in an industrial development. The mechanic who, perceiving how an improvement may be made in this or that portion of machinery, or who, conceiving an original thought, is unable to explain the same by a sketch, is sadly deficient and can not compete with the workman educated, not only to independent thinking, but in the free expression of the same. * * *

We take pleasure in commending, not only the work of the pupils in following the course of instruction used, but the course of instruction itself, as tending to give them at an early age, and even without their recognizing its importance, knowledge and skill which will be of the greatest importance to them in any future work of civil, mechanical, mining, or electrical engineering, or indeed in almost any work of manufacture or construction.

The graduates of the school now number 307. Dr. Belfield, the director of the school, has collected some interesting facts in regard to the occupations followed by 236 graduates, not including the class of 1892.

OCCUPATIONS OF GRADUATES OF THE CHICAGO MANUAL TRAINING SCHOOL.

Occupation.	Graduates.
In higher schools of technology	54
In higher schools of literature	12
In higher schools of law	5
Total in higher institutions	71
In manufacturing establishments as designers	4
In manufacturing establishments as foremen	11
In manufacturing establishments as draughtsmen	24
In manufacturing establishments as machinists	11
In manufacturing establishments as electricians	10
Total in manufacturing establishments	60
Architects and in architects' offices	9
Civil, mechanical, and mining engineers	17
Teachers of drawing and shop work	6
Clerks, bookkeepers, salesmen, etc	54
Miscellaneous	8
Unknown	9
Deceased	2
Total graduates	236

The great success of the Chicago Manual Training School has led to the establishment by the city of a public institution of the same character, called the English High and Manual Training School. A new building was put up, which, together with the site and equipment, cost about $70,000. The school was opened September 3, 1890.

As this is one of the latest schools of its class, established with a generous equipment, it may be interesting to look at its course of study.

COURSE OF STUDY.

FIRST YEAR.

First term.	Second term.	Third term.
Algebra. First part of natural philosophy.	Algebra. Physical geography, with primary principles of geology.	Algebra. Physical geography, with primary principles of astronomy.
English and business letter writing throughout the year. Free-hand and mechanical drawing one hour a day for three terms.		
Carpentry and joinery.	Wood turning.	Pattern and cabinet making.
Twelve lectures on wood as material for building and manufactures.		

SECOND YEAR.

Plane geometry. General history.	Solid geometry. General history.	Conic sections or commercial arithmetic. General history.
English and general composition, three terms. Chemistry or bookkeeping, three terms. Mechanical drawing, one hour a day throughout the year.		
Moulding and casting.	Forging and welding.	Tempering, soldering, and brazing.
Twelve lectures on metals as material for building and manufactures.		

THIRD YEAR.

Descriptive geometry or bookkeeping. Natural philosophy or commercial arithmetic. English literature. Civil government. Machine drawing. Machine shop work.	Trigonometry or bookkeeping. Light and electricity or commercial law. English literature. Political economy. Architectural drawing. Construction of machines. Twelve lectures on machinery and power.	Surveying or bookkeeping. Review of the sciences or commercial law. English literature. Political economy. Topographical drawing. Running and care of engines.

After the first year pupils may elect the commercial or scientific course; and the chemical in place of the metal laboratory work.

Stenography and typewriting are elective after the second year.

During the year 1891–'92 there were 259 pupils enrolled. Of these 175 were in the first year, 61 in the second, and 23 in the third.

The expenditures during the year for the maintenance of the school were $19,798.47, of which $17,688.38 was for the salaries of the 13 teachers employed. The average expense per pupil was $76.44, or, if based on the average number enrolled (217), instead of the total number (259), $91.24 per pupil.

At Peru a rudimentary form of manual training has been in vogue in the public schools for several years. The town has fitted up a wood working shop capable of accommodating a class of twenty. The boys of the public schools take daily lessons for five days in the week in this shop. The instruction relates to the care and use of tools, the nature of materials, and practical designing of simple objects. For

the girls, sewing lessons are provided. Nothing is attempted beyond plain sewing, cutting, and fitting. Wood carving, in connection with drawing lessons, completes the course of manual exercises.

INDIANA.

In the city of Indianapolis manual training has recently received a powerful impetus by the action of the school board. In a small way, and as a matter of experiment, manual exercises in wood turning had been previously introduced into the curriculum of the municipal high school. At a meeting of the school board held May 1, 1891, that body concurred in the report of a committee of its own members recommending the levy of a tax of 5 cents on every $100 of taxable property as authorized by the legislature, for the purpose of establishing and maintaining a manual training school. "It seems the wisest plan," the committee remarks, "to delay until next spring the erection and full equipment of such building. The reason for this is that the funds are not available until the spring and autumn of 1892."

The course of study in the preparatory class of Purdue University at La Fayette embraces one year's work, including instruction in bench work in wood, giving practice in the use of the carpenter's common tools and machine work in wood, etc. Purdue University is, however, an institution that aims at something else than manual training. It is, in fact, a professional school; and any proper classification would bring it into the group of technological schools.

KENTUCKY.

Mr. Dupont, a prominent citizen of Louisville, has made a gift to the city of a building which he will turn over to the proper authorities fully equipped for manual training on condition that it become a part of the public school system, the cost of this building to be not less than $75,000. In addition to this Mr. Dupont has expressed a willingness to expend a great deal more if necessary. The school will be after the plan of the Saint Louis Manual Training School.

LOUISIANA.

At New Orleans University some workshop training is given. The end in view is something more than educational. An effort is made to make the industrial department self-supporting by the filling of outside orders. Instruction and practice are given in carpentry, cabinetmaking, upholstering, printing, and tinsmithing to the boys, and to the girls in plain and fancy needlework and, to a limited extent, in cooking.

In 1887 a female college was opened as a department of Tulane University of Louisiana under the name of the H. Sophie Newcomb Memorial College. In this college there are 15 professors and instructors, and provision is made for the higher education of young women. All applicants for admission must be at least 15 years of age and pass a rigor-

ous examination. The regular courses of study—classical, literary, and scientific—extend through four years and lead to the degree of bachelor of arts. Special studies may be pursued for a shorter period when students elect to take a partial course. The languages, ancient and modern history, mathematics, chemistry, physics, biology, geology, and mineralogy are included in the course; and special prominence is given to drawing, painting, design, modelling and casting, and wood carving. Tuition costs $25 per quarter. The attendance in 1888–'89 was 148, of which number 77 were regular, 11 special students in the literary or scientific course, 43 special art students, and 17 were members of the Saturday art class.

Tulane High School, a department of Tulane University of Louisiana, gives a thorough course in manual training. The manual training school is not a separate department, but a laboratory in wood and iron, where instruction and practice render the student quick, observant, and accurate with the eye, ready, skilful, and exact with the hand, and able to think in things as well as about them, and to execute as well as to describe. The work is not intended to teach trades to young men, but to make them experts in the principles and handicraft of wood working, iron and metal working, and machine construction.

In the physical and mechanical courses, drawing is considered fundamental and enters into every course. All students who enter the high school learn to draw as a matter of general instruction. More than three hours are given to recitations, and an hour and a half to manual training or drawing, daily, except Saturdays.

The catalogue for 1891–'92 shows that the high school faculty consists of fourteen instructors. Of these six belong to the department of manual training, viz., the director, two instructors in drawing, the instructor in iron working, and two instructors in wood working.

With regard to the work the president says, "Our object is general training, not to make artisans. The actual knowledge acquired and diffused is very large, and the satisfaction is general as to the pupils being taught to be handy and useful. We are satisfied as to the outcome."

Straight University, a school for colored students at New Orleans, has nearly 600 in the college, normal, college preparatory, common English, and primary departments. Special attention is given to manual training. There is a two years' course of wood work, of an hour a day, for the seventh and eighth grades. The main features of the work are as follows:

Seventh grade.—Planing to a true surface; laying out work, including measuring with the rule and marking with knife and gauge; sawing to the line; boring, gluing, driving nails and screws; sand-papering; making box-joint, dado, mortise, tenon and groove.

Eighth grade.—Making mitre joint (square, octagon, and hexagon); regular and irregular bevels (using the steel square); scarf joint; dove

tail; laying out curved work; planing and chiselling curved surfaces; sawing curved lines; bending by sawing and steaming; making round forms.

Students during this course are required to make out bills of materials for their exercises, and from other drawings, also, to make occasional working drawings; to learn the names of tools and their parts, their uses, and the reasons for their characteristics; facts about materials used; to observe in what way and where the principles in the exercises enter into construction, and to learn as far as possible the scientific basis on which they rest. They are expected, within reasonable limits, to read plans of wood construction and to execute them intelligently.

The girls receive instruction in sewing, mending, dressmaking, washing, ironing, and other kinds of domestic work. Students of both sexes are taught printing.

MARYLAND.

On March 3, 1884, a school for manual training was opened in Baltimore under the control of the board of commissioners of public schools. At the start it had sixty students.

The course of instruction covers three years. In the first year it includes arithmetic, algebra, geometry, mensuration, English language, history, geography, physiology, physics, geometrical drawing and sketching, carpentry, wood turning, forging, and the proper care and use of tools; in the second year, algebra, geometry, plane trigonometry, mensuration, physics, history, English literature, mechanics, geometrical, mechanical, and architectural drawing, patternmaking, vise work, welding, tempering, soldering, and brazing; in the third year, geometry, trigonometry, physics, mechanics, bookkeeping, literature, chemistry, political economy, geology, engineering, machine and architectural drawing and designing, machine shop work, filing, turning, drilling, planing, etc., and the study of machinery. One hour per day is given to drawing and two hours to shop work. There is a preparatory department, with a two years' course of study, to which boys from the public schools are admitted, on recommendation of their teachers, without examination. Candidates for admission to the full course must be 14 years old, and pass an entrance examination in elementary studies.

The first class was graduated in June 1887. Out of the twenty-five young men composing it, one is an instructor in the school, one a civil engineer, two electrical engineers, one a marine engineer, one a house carpenter, two patternmakers, one a draughtsman, one a farmer, one a car builder, one a machine supply storekeeper, one an architect, six machinists, one a student, and two in mercantile pursuits, all with bright prospects for a useful and prosperous future. The number of students enrolled on December 31, 1887, was 273.

The seventh annual catalogue of this school (1891) contains a report by the principal on the condition and needs of this prosperous institution. He says:

On the 31st of December, 1889, there were 506 students on roll, of whom 9 were special students, and of these 6 were from the Johns Hopkins University. Since that time 211 have been admitted by permits and 38 by transfer, making the total number of students in the school during the year 755, of whom 17 were graduated and 310 withdrew from the school, leaving on the roll at this time 428 students.

A list of 88 graduates is given, embracing the classes of 1887, 1888, 1889, and 1890. Of this number 58 (or 66 per cent.) are draughtsmen, engineers, machinists, etc.

The McDonogh School, founded by the terms of the bequest of John McDonogh and situated 12 miles northwest of Baltimore, on an estate of 835 acres, was opened in November 1873. The foundation is designed primarily for the education of poor boys of the city of Baltimore, in accordance with the will of Mr. McDonogh.

The McDonogh bequest now comprises an endowment fund of $728,500, the farm and buildings, and several tracts of land in Louisiana. Dr. Zenas Barnum left at his death in 1882 a bequest of $80,000 for the promotion of mechanical instruction and manual training in the McDonogh school. One hundred boys were registered as members of this school for the year 1890–'91. Candidates for membership must be poor residents of Baltimore and between 10 and 14 years of age. During the school session of forty-two weeks, from August to June, a portion of the afternoons and of the Saturdays is devoted to manual work. The time so applied averages an hour and a half a day, or nine hours per week. Farm and garden work, bee keeping, dairying the taking of weather observations, etc., are taught, as well as shorthand, typewriting, printing, and wood working. The printing office has been in operation since the summer of 1883, and has grown until 17 boys are now taught to set up type and to do presswork. The wood working shop, which was opened in January 1886, has been gradually extended, so that during the session of 1890–'91 a class of 16 boys was kept at work. Broom making is also taught to a limited extent during the winter months. The alumni of this school number 266, and of these 104 (or nearly 40 per cent.) are engineers or engaged in some mechanical business.

Mr. Alexander Chaplain, secretary of the board of school commissioners, of Easton, Talbot county, writes under date of August 5, 1891:

Three years ago we introduced drawing into all of the public schools of this county, and into the central high school we introduced manual training also. Manual training is not an annex to the school, but an integral part of its curriculum. The literary course was not abridged in any particular, but manual training was introduced for its educational value alone.

MASSACHUSETTS.

In the state of Massachusetts much has been done in the direction of manual education in the towns and smaller cities. Some legislative action has been taken, but for any training beyond drawing it has been of a permissive rather than of a mandatory character. Chapter 69 of the act of 1884 permits the purchase and use of hand tools for schools, the expense to be borne by the town. Section 1, chapter 44, of the public statutes requires industrial drawing to be taught in all the public schools. Section 7 permits every town and requires every city and town having more than 10,000 inhabitants to give free instruction in industrial drawing to persons over 15 years of age. Section 8 goes even farther and permits any town to establish and maintain one or more industrial schools for teaching the arts, trades, and occupations, and to make special appropriations.

Several towns and cities in the commonwealth have taken advantage of the statute to introduce the use of hand tools into their schools, while industrial drawing is a part of the public school instruction in nearly all the larger places. Fortunately, we have an official statement of the condition of the schools of the state in respect to manual training in the form of a special report of the state board of education, submitted to the legislature under date of March 20, 1890. From this report and some later returns we have drawn the following summary of the instruction given in the public schools of the state:

The whole number of cities and towns in the commonwealth is 351; the number in which industrial drawing is now taught is 201; the number using models and objects in connection with drawing is 119; the number employing a special teacher in drawing is 43. Nearly 80 per cent. of the school population of the state, or of pupils between the ages of 5 and 15 years, received instruction in industrial drawing during the school year 1889. The board of education employs an agent, a graduate of the State Normal Art School, who devotes his whole time to aiding the school authorities in introducing industrial drawing among the daily exercises of their schools.

Besides drawing, a considerable number of schools now offer some other form of manual instruction, such as cooking, sewing, clay modelling, carpentry, or metal working.

Carpentry, or wood work in some form, is a part of the course, required or optional, in the schools of Boston, Brookline, Cambridge, Easton, Fall River, Springfield, Waltham, and Winchester. At Dedham a vacation school in sloid work, with four classes of boys, is conducted. In the schools of Stoneham clay modelling and paper cutting are taught.

Instruction in sewing finds a place in the schools of eighteen cities and towns, viz., Boston, Brookline, Cambridge, Dedham, Easton, Fall River, Hyde Park, Lawrence, Malden, Milton, New Bedford, Newton,

Somerville, Springfield, Waltham, Watertown, Wellesley, and Winchester. This work is found more commonly in schools of the grammar grade, though in the case of Easton the instruction begins with the girls of the primary schools.

Cooking is taught to the girls of the public schools in six cities and towns, viz., Boston, Brookline, Canton, Dedham, Easton, and Winchester.

The board, in closing its report, says: "This new element of education is gradually working its way into the schools, and will doubtless in due time take its proper place in our courses of public school instruction." It should perhaps be noted in this connection that not all of this instruction is the result of the appropriation of public funds. In several cases, as at the North Bennet Street Industrial School in Boston, at the English High School in Cambridge, at Easton, and at Fall River, the training, although for the benefit of the public school pupils, is supported by private means.

Instruction in sewing in the public schools of Boston has for many years been a part of the regular course. As long ago as 1870 sewing was made obligatory in every girls' school, though not in the three upper classes. Instruction is now given by special teachers, two hours a week, to the fourth, fifth, and sixth classes of girls in all the grammar schools. In some of the grammar schools the instruction is continued in the upper grades. The work is confined to making useful articles, either for clothing or for domestic use, no ornamental or fancy sewing being attempted. In the first class, instruction is given in cutting dresses and other garments.

As early as 1881 definite effort was made by private individuals in Boston looking to the introduction of manual training into the grammar grade of the public schools. Repeated effort was made by the pioneers in this work to obtain from the school board permission for classes to receive instruction at the North Bennet Street Industrial School, and in September 1883, before formal action had been taken by the board, boys from the Eliot school were sent to the North Bennet street school for instruction in carpentry, printing, and shoemaking, by permission of Mr. Charles E. Perkins, chairman of the third division committee. It was not until February 27, 1885, however, that a hearing was given by the committee on a manual training school to a few persons interested in manual training, the subject under consideration being the acceptance of an offer from Mrs. Quincy A. Shaw to give to pupils from certain schools training in cooking, housekeeping, and laundry work for girls, and printing, carpentry, and shoemaking to boys. During the next March (1885) an order was passed with the following cautious wording, that pupils "whose parents or guardians so request in writing may attend the industrial school on probation for two hours weekly."

In May 1885 the first classes in cooking under this order were

started at the North Bennet street school, pupils coming from the Hancock school. In October of the same year two cooking schools were started simultaneously, each receiving 150 pupils weekly from the public schools. One of these in Tennyson street (Starr King School) was supported by Mrs. Hemenway, and the other was carried on by the North Bennet Street Industrial School.

Mrs. Hemenway supported the Tennyson street school for three years, when, in 1888, its further expense was assumed by the city. The North Bennet Street Cooking School was always largely indebted to Miss Sarah B. Fay, who assumed its entire running expenses from 1887 to 1892, when its support was assumed by the city.

These two kitchens were the first public school kitchens in America. It is to the high standards established by these first two schools, and to the normal classes established later by Mrs. Hemenway, and under the able direction of Miss Homans, that the excellence of the teaching in the school kitchens of Boston is largely due.

In the year 1886 another cooking school was established by private enterprise in Jamaica Plain, and the school board started another in South Boston. The Jamaica Plain school was assumed by the city in 1888.

In 1888 the first experiments were made in Swedish sloid, all previous work with tools in Boston having been based on the Russian course of work. Modifications were at once found necessary in the adaptation of sloid methods to American needs and standards (prominent among which was a satisfactory system of drawing); but the ideas upon which the system is based were found to be so entirely in harmony with those of Froebel as to commend it to the followers of this great teacher, and to decide Mrs. Shaw to offer to the school board opportunities for its study both in children's and in free normal classes taught by Mr. Gustaf Larsson. Three graduates from the school at Nääs were employed by her as teachers, and two new schools started in addition to the one first established in North Bennet street.

So general has been the interest in this new departure that more than a hundred teachers have undertaken the arduous work of the normal classes, while the manifest influence of sloid upon other systems employed here shows how general and how generous has been the recognition of its value.

In the year 1884 a manual training school was opened in the basement of the Latin school, which was carried on for several years; but as the other plans which were being carried on in the other parts of the city were found to be superior, it was closed in 1891.

In the year 1889 the trustees of the Eliot school fund in Jamaica Plain, having experimented with summer schools for some years, offered free instruction in wood working to the pupils of the public schools, and scholars were received that year from five grammar schools and one high school. In the year 1891 these trustees asked

the privilege of making an experiment by giving a four years' course to the four upper grades of the grammar school, which request was granted, and the experiment is now being made.

This system is based upon the course of Russian manual training as introduced by Dr. Runkle in 1876 in the school of mechanic arts at the Massachusetts Institute of Technology, but has been largely influenced by the modified form of Swedish sloid made by Mr. G. Larsson of the Appleton street primary.

At present there are thirteen manual training shops distributed throughout the city for the instruction of boys in the grammar school grades.

All of these are now entirely supported by the city, with the exception of the one in the Appleton street primary school, which is still provided for by the liberality of Mrs. Quincy A. Shaw, and the one at Jamaica Plain, where a portion of the salary of the principal is paid by the board of trustees of the Eliot school fund.

Perhaps especial mention should be made of the school in South Boston. It was said a few years ago that only from 16 to 20 scholars could be instructed at one time in this shop work. Others contended that a much larger number could be taught in one class, and it was felt that unless this could be done the system would be too expensive to be practical.

The old church building on E street, South Boston, was leased by the city and 60 benches were placed in the room. It has been found to be perfectly feasible to teach the demonstration lesson to all the 60 pupils at one time, and in all the new schools provision is made for 30 pupils, which is all that can be accommodated with benches in school rooms of the ordinary size.

The school board has not yet decided upon any one plan of manual training for universal use. It seemed wiser to test several plans, all of which have great merit, which are alike in many respects, and yet which have points of difference. After a longer trial it will be possible to combine the best features of all these into one uniform system. For the present all are giving satisfactory educational results. The shops at East Boston, Appleton street, Allston, and Brighton are following substantially the sloid system as modified by Mr. Larsson for American ideas. Those at Roxbury, Dorchester, Jamaica Plain, and West Roxbury are an outgrowth of the Russian system, Americanized by Mr. F. M. Leavitt with the aid of Prof. R. H. Richards, of the Massachusetts Institute of Technology.

The school at North Bennet street has a third set of models and a little different plan, the result of several years' experiment by Mr. B. F. Eddy. The fourth plan is the one adopted by Mr. F. W. Kendall, and is being tested in the shop at South Boston.

On account of the great expense by the necessary multiplication of many more shops, it is doubtful if for years to come it will be possible

to give throughout the city shop instruction in more than the second class. But it is thought that practically as good results, educationally considered, can be obtained for boys in the lower grade by work done in the school room, and at a very small expense. The work done this year by several of the schools shows that all that is required is a small tray or board, 19 by 13 inches, with a wooden rim, two triangles, dividers, rule, file, and a knife with a stout handle and a blade one and a half inches long. Very thin board is used, the object to be made being first drawn upon it, and cut out with the knife, and the various parts being finally put together in some simple, permanent form. A full outfit for a room of 56 pupils costs about $40; but as most of this outfit can be used for several classes in the same building, the cost in the larger schools is not over 25 cents each year per pupil. The material used, as wood, glue, etc., will not cost over 15 cents per year for each pupil. The color work that is done by the boys in some of the lower grades in the grammar school, while the girls are sewing, costs for the outfit about 12½ cents per scholar, and for the material about 8 cents per year for each pupil.

There are 14 school kitchens where girls receive instruction in cookery. To quote the language of the report:

> There have been for several years such schools in different sections of this city, but this year a sufficient number of new ones have been opened to make it possible to teach the scholars in all sections of the city.

The following facts were adduced by Gen. Francis A. Walker in an address delivered before the National Educational Association in 1887 as proof of the educational value of the Boston cooking schools:

> No one can spend an hour in the cooking schools of Boston, as they have been maintained, first, through the philanthropic enterprise of Mrs. Hemenway, and afterward at the expense of the city, without being impressed by the very high educational value of the instruction given.
>
> As a great object lesson in chemistry, as a means of promoting care, patience, and foresight, as a study of cause and effect, as a medium of conveying useful information, irrespective altogether of the practical value of the art acquired, the short course, which alone the means at command allowed to be given to each class of girls, has constituted, I do not doubt, the best body of purely educational training which any girl of all those classes ever experienced within the same number of hours.
>
> I will mention but a single point. The very large range in the Tennyson street cooking school was, during the last school year, ready to cook any of the dishes that might be prepared by the pupils, from half past nine in the morning until half past four in the afternoon, for 5 days in the week, for 38 weeks. Fires were made, and the dampers and drafts were controlled by the pupils, under the direction of the teacher. The amount of coal consumed in this time was considerably less than two tons.
>
> Now, if any unhappy householder here present will compare this expenditure of fuel with what takes place in his own kitchen, he can

not fail to be impressed by a sense of the prudence, patience, care, forethought, intelligence, and skill involved in keeping up such a service at so small a cost. If this be not educational, pray what is education? And what is true of this is equally true of all the other exercises in the cooking school, under proper tuition.

In Boston, according to the latest annual report of the school committee, the year 1892 was memorable for the progress made in manual training in all its departments. From this report we transcribe the following instructive passages concerning the widely heralded Mechanic Arts High School:

The city council of 1891 appropriated the sum of $100,000 for a mechanic arts high school. The land was purchased at the corner of Belvidere and Dalton streets at an expense of $40,000, but the balance of the appropriation was not sufficient for the building. The city council of this year have appropriated the further sum of $60,000, and the building is now under contract. It is to be three stories in height, 224 feet long by 90 feet wide.

The basement, besides containing the boiler rooms, etc., will be provided with several hundred lockers to contain the regular clothing of the boys when they are in their working costumes. There will be on the first and second floors several class rooms, each to accommodate 72 pupils, in three sections of 24 each; a machine shop with engine, lathes, planers, etc.; a blacksmith shop with 25 forges and anvils; a moulding shop; a carpenter shop; a finishing room; a wood turning room; a chemical laboratory; a reading room and library.

In the third story there will be a large room to be used both as a gymnasium and an assembly hall. The 25 hours' time of the week will be divided into about 10 hours of shop work, 10 hours of book work, and 5 hours of drawing.

The book work will consist of algebra, geometry, trigonometry, physics, and chemistry. The building will accommodate from 300 to 350 pupils, and it is believed that it will be the most complete building of its kind in the country.

It is expected that it will be ready for occupancy by September 1, 1893; and for the first time in Boston the boy who wishes to enter the industrial world will have the same opportunities given to him for preparation at the public expense as have been given so long to those who wish to prepare for a business or professional life.

At Brookline there is a manual training school, where grammar grade boys and girls take courses in mechanical and free-hand drawing, in carpentry, in cooking, and in sewing. There is also a vacation school for carpentry, during July and August, for boys over twelve years of age, where the work is of a more practical character than in the regular school classes.

The girls belonging to the first, second, and third grades in all the grammar schools of Brookline receive instruction in sewing. All kinds of plain sewing are taught, together with cutting and fitting, in the last year of the course. The work is in charge of special teachers.

Cooking has a place in the regular course, the lessons in some of the grades being compulsory. A vacation school is also maintained, for girls over twelve years of age, where cooking is taught.

In regard to the effect of manual training upon the other studies in Brookline schools, Mr. W. H. Lincoln, chairman of the school committee, says, "other branches suffered no detriment; but, on the contrary, the pupils were so benefited by the course in manual training that their proficiency in other studies was greater than it had been in previous years."

The manual training school at Cambridge was founded in 1888 by Mr. Frederick H. Rindge. This is one of the best equipped, as well as one of the most recently established of American manual training schools. It is the result of a careful study of all available information concerning similar institutions in this country and abroad, supplemented by personal inspection of several of the best known schools of its kind.

Although the school is supported by private munificence, and the mechanical work is carried on under the direction of a superintendent responsible only to the founder, it is, nevertheless, in its essential features, a part of the public school system. All who take the regular course are enrolled as pupils of the English High School, and their academic work is carried on under the direction of that institution.

The school was opened in October 1888, and its first class, fifteen in number, was graduated in June 1891. The membership, January 1, 1892, was as follows: First year, 66; second year, 42; third year, 31; class from Lawrence Scientific School of Harvard University, 22; class from engineering department of Tufts College, 11; special students, 20; a total of 192.

These classes of college students are taking the full course of shop work. The instruction is given under the authority of the colleges, and, in each case, is counted as a part of the student's collegiate course.

The three years' course of study, adopted tentatively at the outset, has been considerably modified by experience, and it is now expected that the course will be extended to four years.

From the outset pupils are taught to interpret mechanical drawings and to work from them. All exercises, even those that involve only the most simple operations, are presented to the pupils in the form of blue prints from carefully prepared working drawings. These blue prints are mounted upon heavy cardboard, so that they can be conveniently suspended for reference at each pupil's bench. Full specifications are always given, and no effort is spared to secure the greatest practicable accuracy of execution. All completed work is examined and marked by the instructor with the same care which is given to written tests in other schools.

The aim is to demonstrate the value of manual training as an educational force. Every exercise is chosen with reference to its power to train the eye and the hand, and to develop facility in the use of particular tools. Every task or process is discontinued as soon as the pupil has learned to do it well, and a problem calculated to call forth new power is substituted. The school disclaims any design to teach special

trades, but an earnest effort is made to fit boys to enter upon their life work without loss of time, and with greatly diminished liability to err in the choice of occupation. Experience has shown that the graduates readily find suitable employment at higher wages than they would have been likely to receive without this special training.

The following outline will serve to give a tolerably adequate notion of the variety of the exercises:

Carpentry.—Saw and chisel exercises; halved joints; blind mortise and tenon joints; open mortise and tenon joints; halved dovetailed joints; dovetailed joints; brace joints; boring exercises; dowel joints; table leg and rail; triangle, 30°, 60°, and 90°, glued; model of a newel post; and a tool chest.

Turning and patternmaking.—Straight cylinder; broken cylinder; stepped cylinder cone; curves, convex, concave, and compound; spheres; banister posts; rosettes; mallets and handles; rings of round sections; rings of octagonal sections; engine crank; lathe face-plate; ratchet wheel; T-pipe fitting; sheave wheel; hand wheel, etc. During the last half of the second year, the pupils of each class make patterns of all the parts of some machine. The castings are obtained and the machines completed during the next year.

Blacksmithing.—Exercises in drawing, upsetting, bending, twisting, riveting, welding, punching, and tempering. Some of the articles made are the wedge; the square point; sign dogs; stone dogs; S-hooks; bent rings; welded rings; harness hooks; truck hangers; hook and staples; swivels; shafting keys; shaft with shoulders; bent angle irons for strengthening joints; welded angle irons; chain links; eye bolt and ring; clevice with bolt and cotter; bolts and nuts, square and hexagonal; lathe tools; tempered spring; flat drill; hammer; blacksmith's tongs, etc.

Metal work.—Exercises in chipping, filing, scraping, polishing, fitting of sliding parts, drilling, hand-turning, bolt cutting, tapping, etc. Some of the articles made are surface gauge, calipers, electric binding posts, and turned brass ornaments.

The founder of the school has recently decided to erect immediately a building adapted to accommodate the academic work of the manual training course. The building will be placed in the rear of the present structure, and will be connected with it by a covered passage way. It will contain three large school rooms, a physical laboratory and apparatus room, and an assembly room. A considerable portion of the basement will be used for a large drill room, near which will be toilet rooms, wash rooms, a shower bath, and all needed conveniences for the athletic teams. When this building is completed, the conditions for testing the educational value of manual training ought to satisfy its most exacting advocates.

The manual training school is merely an additional factor in the Cambridge school system. It supplements the work of the grammar schools with a useful course of study, likely to prove peculiarly attractive to many boys. It does not interfere with the work of any other school.

The staff of teachers in this school consists of the superintendent, a medical director, an instructor in machine shop practice, an instructor in mechanical drawing, an instructor in blacksmithing, an instructor in turning and patternmaking, an instructor in carpentry and joinery, an assistant in machine shop practice, an assistant in drawing, and an engineer.

At Fall River the B. M. C. Durfee High School offers a manual training course coördinate with courses such as are usually offered in high schools. The course covers a period of four years, and is intended to prepare pupils for the Massachusetts Institute of Technology and other scientific schools or for active life. The manual training includes mechanical drawing, carpentry, joinery, iron fitting, wood turning, patternmaking, and care of tools and machinery. The shop work takes up about two-fifths of the time, bookwork and drawing occupying the remainder.

In the public schools of Lowell drawing has been taught for twenty years. An evening drawing school is now maintained for those who are unable to attend the day school. During the year 1890, 592 pupils were enrolled, of which number 343 were males and 249 females. In April 1890, sewing was introduced into the grammar grades. Aside from these specific exceptions, Lowell schools have no manual exercises. The superintendent has recommended that shop work be added for the boys in the high school, but as yet no action has been taken.

Sewing was introduced into the schools of Somerville in October 1888. The work has been graded in the same manner as the regular school work, apportioning certain stitches to each year. The fourth grade learns the proper use of the needle and thimble, correct position of body, hands, and work, and four or five different stitches, making at the close of the year a simple article without gathers. Grades five and six are taught enough additional stitches to make a garment with gathers, qualifying them to make nearly all articles of underwear with a little oversight. Grades seven and eight add to the previous work instruction in darning, patching, herring-bone stitch, and buttonholes. In this systematic fashion, sewing is taught to all girls of the grammar schools. Two special teachers are employed, who give all the instruction in this branch. The superintendent has recommended that sloid and other forms of manual work should be provided for boys in the public schools.

Mr. George B. Kilbon, of the Springfield Manual Training School, speaking before the Manual Training Conference at Boston in 1891,

sketched the history of the work done in that city. The experiment there was begun in April 1886, when, at the solicitation of the school committee, the city gave $1,000 for the purpose.

One-half of this sum [Mr. Kilbon states] was spent in equipment, and the other half in paying for tuition. Twelve benches and twelve sets of tools were bought, and the school commenced. So satisfactory was the experiment that the next two years the city gave $3,000 a year, then $4,000 for two years consecutively, and this year (1891) voted $4,500. So one may see the interest has been growing from the outset. The school is on a substantial foundation, because it has been accepted by the school committee and is under the regular school régime. We have now 18 joinery benches, 8 wood turning lathes, a moulding equipment of 12, a carving equipment of 18, and a partial equipment for iron work, consisting of 1 forge, 1 planer, 1 engine lathe, 1 drill press, 4 vises, and 4 sets of bench tools. A Shipman engine of six-horse power drives the machinery.

The Springfield Manual Training School has two departments, high school and grammar school. Its high school department consists of a three years' course of daily work in scientific study, drawing, and manual work, providing for joinery, wood turning, and carving during the first year; forging, patternmaking, and moulding during the second year; and iron chipping, filing, and finishing during the third year. The grammar school department consists of a one year's course of weekly lessons for the senior grade. In both departments the manual lessons are of one and one-half hours' duration, the drawing lessons in the high school being three-quarters of an hour.

A third department of the manual school is projected. We have some wide-awake lady teachers among us who wanted something of the kind; and, when an opportunity was offered them to learn the use of tools, thirty-seven improved it. They were organized in three classes, and went on with the work, happy as could be, happy as any set of boys, and did as good work. * * *

After some months of work another question arose. A few of these teachers asked the privilege of giving manual lessons to boys under their charge, in grades fifth to seventh, which was granted; and $10 was expended for tools for an experimental class of twenty-four fifth-grade pupils. We arranged a course of lessons in which the pocket knife was the only cutting tool used. For laying out problems five additional tools were used—try-square, gauge, rule, dividers, and pencil. The work was done in the ordinary school room, the desks being protected from injury by movable covers. The success of this led to the arrangement of a four years' course in knife work. These years precede the senior grammar work. Our boys in the fifth grade are nine years old and upward. In this course we have first surface forms cut from thin wood, then some knife carving, then geometric forms cut from thicker wood, then cubes, prisms, cylinders, and cones are cut, then a few joints are made. The fourth year natural and mechanical forms are cut, all done with the knife.

Our school at first met with some opposition, though I hear of none today. We have been able to take only one class of girls, though more want it. But we can not do everything with the money the city gives us. This one class has done excellent work. We thoroughly believe in drawing and have an efficient drawing teacher.

* * * * * * *

We have also in Springfield sewing, paper cutting and folding, and clay modelling. The outline in the mind of our educators is that the kindergarten should be followed by clay modelling, this to be succeeded by the knife work, which, in its turn, should continue till pupils reach the age for a general tool course. That will give a consecutive course of manual training from the earliest years up through the years during which the public school has charge of the pupil. We do not claim to be omniscient; but we have done the best we knew how. We shall do tomorrow better than we have done today, because we shall know better then what we want to do.

MINNESOTA.

A manual training course was introduced into the Duluth high school in 1889. During the first and second years of the course the manual work consists of industrial drawing and wood work, followed in the third and fourth years by industrial drawing and metal work.

In the Minneapolis public schools a conservative beginning of manual training has been made by introducing industrial drawing and wood working at the Central high school and at the two branch high schools. This work was begun in January 1887. The high school now affords a carefully arranged manual training course with architectural and machine drawing, and wood and metal work. The course extends over four years and is coördinate with the other high school courses. The principal of the Central high school, writing July 9, 1891, stated that of the five who had graduated from the course up to that time three were already in a technical school and the others would soon enter.

At Saint Paul a beginning of instruction in manual training in the public schools was made in October 1887. A room in the basement of the high school building served for a workshop. It was fitted up with benches, tools, etc., sufficient to accommodate 8 classes of 12 pupils each.

At first both boys and girls were permitted to undertake the work, but at the end of one year the course of study was rearranged for boys only. A course of special training suitable for girls is contemplated by the school authorities, but it is deemed best to await the results of experiments now in progress elsewhere before establishing such a separate course.

The work grew so in public favor that a new school was established entirely distinct from the high school, and a new building erected. This school now has a faculty of eleven members. Over 100 pupils were enrolled during the year ending June 1890.

The system of instruction adopted in the school comprehends three courses of study covering three years each. The business course is designed to give a symmetrical and practical education to boys who for any reason do not intend to pursue a higher course of study; the preparatory course is for boys who wish to enter polytechnic and en-

gineering schools; and the Latin course for those who wish to complete their preparatory training in the high school and then pursue a classical course in college. In all the courses the same plan of manual training is followed, the only difference being in the kind of book work. The manual work includes drawing, joinery, wood turning, wood carving, patternmaking, forge and foundery work, and machine shop work.

MISSOURI.

The Saint Louis Manual Training School was opened September 6, 1880. This is the pioneer school of manual training in the United States. It is equipped with all the appliances necessary for the successful prosecution of its work, and its courses of study and practice are admirably coördinated.

The arrangement of the three years' course of studies, tool work, etc., is substantially as follows:

First year.—Algebra, through simple equations; review arithmetic; English language, its structure and use; history of England; Latin, French, or German grammar and reader may be taken in place of English and history; American classics; commercial geography; elementary physics; botany; drawing, instrumental and free-hand from objects; penmanship; joinery; wood carving; wood turning.

Second year.—Algebra, through quadratics and radicals; plane geometry; chemistry, theoretical and practical; English composition and literature; rhetoric; English or French history; Latin (Cæsar), French, or German may be taken in place of rhetoric and history; British classics; bookkeeping; drawing, line shading, and tinting; forging; patternmaking; moulding; casting with plaster; soldering and brazing; military drill.

Third year.—Geometry continued through plane and solid; reviews in mathematics; mensuration; English composition and literature; civics and political economy; general history; French or German may be taken in place of English and history, or in place of the science study; physiology; elements of physics, with laboratory practice; mechanism; military science and tactics; drawing, brush-shading, geometrical, machine, and architectural; metal work with hand and machine tools; filing, chipping, fitting, turning, drilling, planing, screw-cutting, etc.; execution of projects; military drill.

Candidates for admission to the first-year class must be at least 14 years old and pass an entrance examination in arithmetic, geography, spelling, and penmanship, and in writing English, with the correct use of capitals and punctuation.

In a late catalogue of this school, the director says:

The school has served to demonstrate the entire feasibility of incorporating the elements of intellectual and manual training in such a way that each is the gainer thereby

As this is the oldest of the manual training schools, a glance at results as shown by the occupation of the graduates may prove interesting. In a letter to the Indianapolis News, the director of the school, Prof. C. M. Woodward, has presented the facts in regard to the first 200 graduates:

The Saint Louis Manual Training School was opened in September 1880, and its first class (29 members) graduated in 1883. A class has graduated every June since, the last (1891) class numbering 56. The whole number of graduates is 386.

In quoting the record I shall limit myself to the first 200: The classes of 1883, 1884, 1885, 1886, 1887, and nine in 1888, omitting six, who are unknown.

The first striking thing about the 200 is the fact that 67 of them went on into "higher education," general or professional.

If the best fruit of education is a "mental appetite," as has been said, our educational tree bears good fruit, for in unexpected numbers our students crave more education. In fully half the cases the boys who have "gone on" had no intention of going beyond the manual training school when they entered it. The development of an educational appetite on the part of the student, and the final consent to gratify it even at a sacrifice on the part of the parents, are events which continually bear testimony to the stimulating effect of the school. In several cases students have spent on higher education money earned after leaving the "manual" school. Higher education is expensive and no small proportion of these 200 young men were unable to command the necessary funds.

The present occupations of these 200 are as follows:

Engineers (civil, mechanical, and mining)	34
Physicians and dentists	6
Lawyers	4
Editor	1
Art student	1
Teachers	20
Superintendents, managers, and foremen	21
Clerks (railroads, banks, manufacturing, and commercial houses)	49
Farmers and stock-raisers	7
Partners in business (all kinds)	27
Draughtsmen and architects	14
Mechanics (11 machinists, 4 patternmakers)	15
Letter-carrier	1
Total	200
Went on into higher education, more or less	67

The large number of educated engineers in the above list will next be noted, and then the small number of mechanics, but this requires explanation.

If I omit those who go into higher education with a definite occupation in view, the most common employments of our recent graduates are drafting and tool work. There is a lively demand for this class of workers, and our boys are able at once to earn good wages.

Though these can not be called either skilled or experienced, they seem to master the practical details with little difficulty, and they generally give great satisfaction.

Many of these boys fill mixed positions, dividing their time between drawing, keeping books, and working in shop. I frequently receive letters asking for a "graduate of the school," his capacity for general usefulness being fully recognized.

For a year or two these persons are rated on their employers' books as draughtsmen or mechanics. The next thing, I am surprised to be informed, is that they are superintendents, or assistant managers, or foremen, or officers of a company.

A word in regard to the large number of clerks, nearly 25 per cent. of the whole: Our graduates are eagerly sought for positions where their experiences in drawing and shop enables them to deal intelligently with work done in manufacture or with the articles handled. Hardware, manufacturing, and railway companies appear to find these clerks valuable. Not one appears as a clerk or salesman in a retail dry goods, clothing, furnishing, or provision store or grocery.

The number of our alumni filling positions of high responsibility is quite remarkable. They are well known in Saint Louis, and it is they who have done so much to increase the popularity of the school.

There are several explanations of the extraordinary success of these young men:

1. In the first place they are not afraid to work with their hands. While they cordially dislike drudgery and can not endure "work that leads to nothing," they have no prejudice against the inevitable dirt and oil of a shop. They generally prefer active work, if it is interesting, to standing around or sitting still.

2. They can do more than one thing. They can make a drawing, or pattern, or model, or keep books, or set up a machine with equal facility. People of this sort soon become valuable.

3. They are not content with clumsy apparatus and laborious methods when they can devise better ones. It is a common occurrence for me to hear of "little improvements" and inventions made by our graduates in connection with their daily cares. Most of these inventions are devices for saving labor and preventing waste, and are patentable in character; others are of a high order of merit and a source of income. The ability to embody a mechanical idea in a readable drawing and then to construct a working model is indispensable to the successful inventor.

The number of inventors among our graduates is so great that I am thinking of collecting statistics on the subject.

4. Perhaps the most valuable habit our graduates acquire is that of working systematically on a plan they have fully matured. This is closely allied to the predisposition to invent, just pointed out, but it bears very emphatically upon the faculty of laying out and directing large plans of work. This makes them useful both in the formation of schemes for improvement and their execution.

An instance occurs to me in illustration of the last paragraph. A graduate (one of the 200) came into my office a year or two ago to shake hands and tell me of his affairs. He was a prepossessing young man about 22 years old. Said he: "I am a blacksmith, and I think I am the only graduate who is a blacksmith."

This was very interesting to me, for though every graduate is fairly trained in the arts of iron and steel forging, and I knew that several had temporary employment at the forge, no one to my knowledge had remained there. So I asked him to tell me how he was getting on.

He said that on leaving school he went to work with his father who was a blacksmith. He soon found himself at home in all the work of the shop, and then he saw opportunity to improve and enlarge in important directions, so he introduced new tools, employed more men, and constructed devices for handling heavy work. "And now," said he, with evident pride, "I have 26 men at work under me, and we are prepared to do any forging, heavy or light, that the city may bring."

Here was a young man not five years from the manual training school who had outstripped his father at his own trade.

Some of my readers may recall a trip in a Pullman sleeper where the water flows into the washbasins as if from a hydrant, without the assistance of an awkward pump. This improvement, with all the details involved, was made by one of our graduates.

His device consists in connecting the tank of compressed air belonging to the air brake with the upper side of a long cylinder full of water lying beneath the floor of the car. The air serves to force the water up to the washbasins with considerable pressure. This young man has been very successful in the Pullman company, and he has opened the door to some half dozen of his fellow alumni.

It frequently happens that I hear of the sudden promotion of a young man who had entered some shop at moderate wages to do what he could and learn the business thoroughly. There is generally great surprise that he can do so much and so well on mere school training, and presently he outstrips all expectations in the progress he makes. I remember one who entered an iron fitting shop at about $1.50 a day. Before half a year had elapsed he had been "found out" and was given the position of assistant superintendent in a large glass works near by. When I next saw him he was making plans for a new office and drawing room. There was then no agreement as to wages, but he was not anxious. He is still with the glass company earning a fine salary.

I could go on indefinitely telling of the triumphs and successes of our graduates. Undoubtedly there are successful graduates from all schools, but I do not hesitate to say that in a most conspicuous manner our graduates have seen the quick and unmistakable advantage gained by means of their manual training. A young man just out of school and interested in a steam sawmill in one of the southern states writes that he is acting as superintendent, and that manual training comes in "mighty handy" when a "mere trifle might disable engine and machinery for a whole day while all the men lie idle."

At the present, and for a long time to come, the demand for teachers of manual training is and will be very active. The very best shop teachers are those who, having gone carefully over the work of a manual training school, take higher work in literature, science and art for several years, studying meanwhile methods of teaching and laboratory work in science and in shop.

My advice to students is: "Get all the training and culture you can." I have known men to suffer from lack of education and training, never from their possession. No one has ever been injured by his ability to make a scale drawing, to construct a pattern, to temper a drill, to sharpen a chisel, or to match and glue two pieces of wood, any more than he has by the ability to spell correctly, to translate a page of Latin or French, or to explain a dynamo.

When he can do both these and those he is sure to be in demand.

It is evident from what I have said that I do not regard the manual training school as a finishing school; its training is broad and generous, preparatory to more special training in special higher courses, or in the activities of practical life.

NEBRASKA.

Omaha has attracted considerable attention among educators on account of her early incorporation of manual exercises with the ordinary school system of training. The course is optional, those taking it doing the same book work as the rest of the school. The work at

present is confined to the high school grades. The superintendent of schools, in his report for 1889, says:

I believe it better that this work be made a part of the high school course only. Eighth grade pupils have enough to do in the ordinary work of the grade, no part of which is of less practical value than the studies of this department, and there is a tendency, in introducing the mechanical work in the lower grades, to neglect that which is more important. * * * Furthermore, if the grades below the high school are allowed to take this work the incentive which it offers to enter the high school is in a large measure taken away.

During the year 1889, 57 boys and 7 girls took carpentry, 76 boys and 8 girls took wood turning, and 22 boys and 2 girls took wood carving. Of these, 62 were from the high school and 32 from the eighth grade.

The subject of introducing sewing, dressmaking, and other departments for the benefit of the school girls has been discussed, and a teacher of cooking has been employed. The system can not be said, however, to have become definitely fixed.

NEW HAMPSHIRE.

In the public school system of Concord provision is made for manual training. The work includes a course in wood work and a course in sewing, both optional with the pupil. During the school year 1890–'91, 110 pupils received instruction in wood work. Of this number only 12 were from the high school. Two hundred and thirty-five girls of the public schools were taught sewing, 23 of whom were high school pupils.

NEW JERSEY.

New Jersey has already been spoken of as one to give early legislative aid to the cause of industrial education. The first act looking to the introduction of this element into its system of public instruction bears date of March 24, 1881. The object as stated in the words of the act was the "establishment and support of schools for the training and education of pupils in industrial pursuits (including agriculture), so as to enable them to perfect themselves in the several branches of industry which require technical training." This act provided that—

Whenever any board of education, school committee or other like body of any city, town or township in this state shall certify to the governor that a sum of money not less than three thousand dollars has been contributed by voluntary subscriptions of citizens or otherwise, as hereinafter authorized, for the establishment in any such city, town or township of a school or schools for industrial education, it shall be the duty of the said governor to cause to be drawn, by warrant of the comptroller, approved by himself, out of any moneys in the state treasury not otherwise appropriated, an amount equal to that contributed by the particular locality as aforesaid for the said object; and when any such school or schools shall have been established in any locality as aforesaid, there shall be annually contributed by the state, in manner

aforesaid, for the maintenance and support thereof, a sum of money equal to that contributed each year in said locality for such purpose; *provided, however*, that the moneys contributed by the state, as aforesaid, to any locality, shall not exceed, in any one year, the sum of five thousand dollars.

The act further provides for the appointment of trustees to be given the organization and management of such schools. Additional provision is made for the prospective schools by giving to the city, town, or township power to appropriate and raise by tax money for their support.

This act was only a beginning. Subsequent legislation, made on the same general lines, has considerably extended the benefits of state aid. The act of March 7, 1888, "for the promotion of industrial education," and the act of February 15, 1888, "for the promotion of manual training," required but $500 to be raised by taxes and subscriptions before state aid in an equal amount could be obtained. This, of course, placed outside aid within the reach of many more of the cities and towns.

It would be interesting to know just to what extent these acts have influenced the development of manual or industrial training in New Jersey. Unfortunately we have not at hand complete information on this subject. As in any new movement, changes are constantly being made by the introduction of the work in new places or by its development where already established. It should not be assumed that the industrial movement in New Jersey owes all that it has accomplished to legislative aid. The beginning at Mont Clair was made independently of any outside aid. Nor should it be understood that all the results of the legislation have been in the direction of manual training. The Newark Technical School is something quite different from the manual training school.

From the report of the state superintendent of public instruction for the school year ending August 31, 1891, it appeared that manual training in some form had become a part of the course of instruction, either optional or required, in the public schools of thirteen cities and towns, viz., East Orange, Garfield, Hoboken, Mont Clair, Morristown, Orange, Passaic, Paterson, South Orange, Union, Vineland, Weehawken, and West Hoboken. Probably the next report when issued will show its introduction in other schools. In several places the matter is known to have been agitated with some promise of success.

Hoboken offers a striking example of manual training in the public schools as the outgrowth of state aid. The instruction is not in the hands of the city authorities, but is controlled by a board of trustees who employ the teachers and guarantee the expenses. The funds, however, are now derived entirely from city and state appropriations. In the earlier days of the work much of the money was raised by subscription, and a part of the funds so accumulated is still in the hands of the trustees.

The work was begun in December 1885. It has grown so that in 1890 an attendance was reported, in all departments of instruction, of 1,430 pupils. The numbers in the various departments were: Wood working, 240; cooking, 350; clay modelling and wood carving, 240; sewing, 600. The accommodations are insufficient. The work is for the most part carried on in a building apart from the schools, to which classes are sent in turn.

The instruction now offered includes clay modelling, wood carving, and wood working for the boys, and sewing and cooking for the girls. Clay modelling is practiced one hour and a half a week during the first year of the manual course. This is followed by exercises in wood carving. During the third year joinery is taken up for two hours and a half a week. The sewing course includes lessons and practice in outline running, figure-stitching, hemming, felling, sewing on buttons, making buttonholes, darning, patching, etc. The course in cooking includes instruction in the care of supplies, materials, and utensils, in the selection of materials, and in the chemistry of cooking, with practice in cooking.

Probably the most widely known example of public school manual training in New Jersey is found at Mont Clair. The work was begun October 1, 1882, the trustees having appropriated $1,000 for the purpose. The pupils of the second and third grades of the grammar schools, averaging 12½ years of age, were selected for the experiment. The work has continued without interruption since that date.

The manual training as now arranged consists chiefly of clay modelling, cabinet work, wood carving, sewing, cooking, wood and metal turning, and vise work. The shop work is carried through all grades and required of all pupils up to, not into, the high school. The aim of the work is not to produce articles of value nor to teach any trade, but to discipline the mind through the hand and eye. The manual exercises are on the same footing as the other branches of school work, the two hours a week devoted to them being taken from school hours.

The expenses of the work have not been great. For fitting up the workshop in a school building and supplying it with benches, tools of various kinds, etc., about $350 was used. The whole cost of starting and carrying on the school during six years was: First year, $725.86; second year, $599.34; third year, $582.51; fourth year, $681.19; fifth year, $708.53; sixth year, $667.96.

A complete account of the course of training in the Mont Clair schools will be found in Chapter XI.—The Kindergarten in Relation to Manual Training.

Orange is another place that has availed itself of the offered state aid. In 1887 the city appropriated $1,000 for the introduction of manual training into the public schools. In accordance with the law already referred to, this entitled the city to another $1,000 from the state. Instruction was at once begun in schools of every grade. Sewing, paper

weaving, and clay modelling were taught, and kindergarten methods were introduced into the primary grades.

Sewing is now a part of the work, being taught in all grades, including the high school. Cooking lessons are also given in the upper high school classes. Boys of the grammar and high school classes receive lessons in simple carpentry. Industrial drawing was introduced into the schools of Orange about fourteen years ago, and still maintains a prominent position.

At Paterson, during the year ending March 19, 1891, the total number of boys receiving manual training instruction was 350, arranged in 15 classes ranging from 15 to 30 pupils in each class. Each class received one and a quarter hours' instruction per week. A large number of the high school boys completed the list of 25 lessons, covering all the forms of simple joinery. Considering the limited time, amounting in the aggregate to about 50 hours per year for each class or pupil, the development of skill has been quite remarkable.

At Vineland manual training was instituted as a branch of public school instruction by a natural and easy method in 1887. The sum of $500 had been appropriated by the town with which to begin the work; but this amount would not hire a special teacher. Accordingly the school board sought for a man who could act as principal and train the 17 teachers so that they could teach the children in their schools. They found a man of the right stamp, and in June 1887, opened a summer training school for teachers with an attendance of 45, and here the year's work was taught.

Drawing lessons are given twice a week to all pupils. Clay modelling was introduced in 1888. Lessons in carpentry and lessons in budding and grafting are now given. For the school year ending August 31, 1891, Vineland received from the state $1,000 toward the support of this special teaching, an equal amount having been voted by the district.

NEW YORK.

Manual training was introduced into the Albany High School in the form of wood work in January 1888. Superintendent Charles W. Cole said of it in 1890:

> Manual training is no longer an experiment with us. We have become satisfied of its high educational value, and we believe it will remain a fixed element in our system. The question to be determined, however, is how far up and how far down it shall be extended. Thus far we have confined shop work to the high school boys; next fall we shall introduce wood working in the sloid form among the girls in the high school.

This has since been done.

Superintendent Cole has noted an interesting and important effect of the work upon the attendance of boys in the high school. In 1891 he stated that previous to the introduction of manual training the pro-

portion of boys to girls in the Albany High School had been 30 to 70; it was now 48 to 52.

Prominent among manual training schools of its grade is the high school of the Pratt Institute, Brooklyn. The three years' course of study is designed to fit boys and girls for their life work, and, "without ignoring or antagonizing the education of the past, seeks to perfect this by supplying the elements heretofore disregarded." The school "does not endeavor nor wish to prepare for a particular occupation, or class of occupations, but rather tries to make its course as broad and general as is consistent with the age of the pupils and the time spent in its completion. Geometry and chemistry are introduced into the course, but not with the primary object of preparing teachers of mathematics or science; so manual work is made a feature, but not in order to train carpenters or machinists; on the contrary, the literary work and all forms of manual work are made parts of the course of instruction for one and the same reason, because of their disciplinary and educational value."

As in most of the manual training high schools, the course of study is arranged to meet, as far as possible, the requirements for admission to advanced scientific, technical, or other schools, and at the same time to supply the needs of that larger class of boys and girls who finish their school room education with the high school.

The course of instruction, as set forth in the catalogue of the institute for the year 1891–'92, embraces, in the first year, English language and rhetoric, algebra and geometry, physiology and physical geography vocal music, free-hand and instrumental drawing, model and cast drawing, and clay modelling. The manual work for boys consists of bench work in wood, wood turning, patternmaking, and principles of moulding; for girls, sewing, hygiene, and home nursing.

In the second year the studies are general history and English history, or Latin. Essay writing, geometry, trigonometry, bookkeeping, physics with laboratory practice, vocal music, perspective, architectural drawing, elements of design, and mechanical drawing are also taught; while foundery moulding, forging, and tinsmithing for boys, and dressmaking and wood carving for girls, constitute the subjects of the manual training course.

In the senior year the subjects taken up are English literature, civil government, political science, French or Latin, essay writing, principles of construction, chemistry and metallurgy, vocal music, mechanical drawing, problems in construction; and in manual work, machine shop and bench work, machine tool work, and construction are assigned to boys, and cooking, millinery, and dressmaking engage the attention of the girls.

The school year in the high school department is divided into three terms, and the tuition per term for the first year is $10, for the second year $15, and for the third year $20.

In the autumn of 1874 a printing office was opened at Jamestown, in one of the school buildings, and fitted up with press, type, and fixtures, at a cost of $125, for the purpose of affording an opportunity to the boys and girls of the grammar and high schools to learn type setting as a form of manual training.

Since that date the scope of the work has been greatly extended. Two wings have been added to the high school building, and in the basement are two rooms, one of which is used for a sewing room and printing office, and the other for the shop. The rooms are about 28 by 37 feet, are well lighted and pleasant, and are supplied with all needed tools, material, and instructors, and are kept open during all the school hours of the day, four days of the week.

Superintendent Love writes:

Today, January 19, 1887, this much can be said of the department of manual training in Jamestown public schools. All the pupils in the first six grades, about 1,400 in number, are given lessons daily, or at least three or four times a week, in some kind of manual training. One hundred and twenty-five of the girls and 65 of the boys receive lessons in the sewing-room or shop at least twice or three times each week, and 20 boys and girls set type in the printing office, one hour, four days of the week.

The system is well organized; and, from the lowest primary departments, in which kindergarten exercises are practised, to the academic department of the high school, the work is carried forward by easy stages of gradation. Up to the seventh grade the course varies but little from that of other manual training schools. Beginning with the junior class of the grammar department, the instruction for the remainder of the course is as follows:

Junior grammar class.—Penmanship; drawing, free-hand and industrial; physical culture, exercises in gymnasium; manual training for boys—to draw lines and lay off distances, use of the hammer, the saw, the plane; manual training for girls—plain sewing, running, gathering, stitching, overcasting, over-and-over sewing and hemming; printing, boys and girls—(1) learn the letters in the lower case, (2) also in the upper case, (3) to hold and handle the stick, (4) to set up and distribute words, (5) also sentences, (6) to set up and distribute copy.

Middle grammar class.—Penmanship; drawing, free-hand and industrial; physical culture, exercises in the gymnasium; manual training for boys—review the work of the last year, lessons in construction, boring, chiselling; manual training for girls—crocheting, knitting begun; printing, boys and girls—(7) to learn to correct proof, (8) to set up copy and distribute it on time, (9) to make up and lock forms.

Senior grammar class.—Penmanship; drawing; physical culture, exercises in the gymnasium; manual training for boys—review lessons of the last year, lessons in mitreing, dovetailing, dowelling, begin drawing and construction; manual training for girls—knitting advanced, mending, patching, darning, making buttonholes; printing, boys and girls—(10)

run the press, (11) wash type and distribute form, (12) do job work given out.

In the academic department, comprising the tenth, eleventh, twelfth, and thirteenth grades, the work in manual training is as follows: For young men—drawing and construction, the lathe, finishing, printing; for young women—cutting, the use of the sewing machine, embroidery, cooking, printing.

The means for meeting the cost of manual training at Jamestown were at first derived exclusively from the proceeds of exhibitions given at intervals by teachers and pupils, and even now the expense is mainly provided for in the same way, only a small amount coming from the public school fund.

In 1892 Superintendent Rogers reported that "the usefulness of the department of manual training is greatly hindered by lack of proper facilities. In spite of its many limitations the value of this instruction may be regarded as fully established."

Newburgh has a manual training school, with a complete equipment for teaching carpentry in a four years' course. The instructor receives a salary of $1,200 a year. There are, also, two teachers of sewing, paid, respectively, $400 and $500 a year. The total number of boys taking manual training is now 160.

As to sewing, the city report states the number of classes in this branch to have been 36 in all, with an average number of 20 pupils to a class, or 720 altogether. A lesson of one hour a week is given to each class.

Instruction in manual exercises began in the schools of New York city on February 1, 1888. There is a graded course of study, beginning with the lowest primary grade and progressing through every succeeding grade of the primary and grammar school course. The full course requires 14 terms for completion.

The work has not been introduced into every public school, but all pupils in the several schools where the work has been introduced are compelled to study all the subjects taught in their respective classes. Any pupil not wishing to attend a manual training school may attend one of the other class of schools, and any pupil of the schools having the regular course of study may at any time enter one of the manual training schools.

The work consists of paper folding and cutting, free-hand and mechanical drawing, clay modelling, wood working, sewing, and cooking.

There are 37 departments pursuing the manual training course of study, the whole number of pupils registered December 31, 1891, being 19,935, with an average attendance of 18,249. These schools consist of 7 male grammar departments, 8 female grammar departments, 1 mixed grammar department, 13 primary departments, and 8 primary schools.

There are 122 classes in sewing, containing 5,675 pupils; 22 classes in cooking, containing 614 pupils; and 55 classes in workshop (wood working), containing 1,811 pupils.

Modelling in clay is a part of the course of instruction in 229 classes, containing 8,703 pupils; but clay is used in form study in 193 other classes, containing 10,640 pupils. All the pupils receive instruction in the English branches and in drawing (free-hand or mechanical). The course pursued in this class of schools seems to be meeting with general approval.

The College of the City of New York, established in 1848, gives, among its courses of instruction, a three years' mechanical course, which is, in detail, as follows:

FIRST YEAR.	Lessons per week.
French, German, or Spanish	5
English language	3
Mathematics	3
Physics	2
Drawing, free-hand and mechanical	3
Workshop, instruction and practice, or commercial products	4
	20

SECOND YEAR.	
The same modern language as before	5
English	3
Mathematics	3
Chemistry	2
Drawing	3
Workshop or commercial products	4
	20

THIRD YEAR.	
A second modern language	5
English	3
Mathematics	3
Physics and chemistry	5
Workshop, or history and political economy	4
	20

The subject of commercial products in this course includes the study of raw and manufactured products. Raw materials are studied as derived from (1) the mineral kingdom, as metals, ores, coal, petroleum, etc.; (2) the vegetable kingdom, as grain, timber, textile fabrics, tea, coffee, etc.; (3) the animal kingdom, as silk, wool, fur, hides, meat, etc.; (4) the sources of supply and lines of conveyance, or what is generally known as commercial geography, a subject much studied in European countries, but too often ignored in America.

The workshops are 3 in number. The wood working shop contains 15 double benches, with closets and tools for a class of 30. The forge shop contains 6 Buffalo forges, 20 anvils, and 2 long benches with 15 vises, with forge and vise tools, and accommodates a class of

from 15 to 30 students. The lathe shop contains 26 lathes for wood and metal working, 4 engine lathes, a circular saw, and 6 grindstones.

For admission to the lowest class the student must be 14 years of age and a resident of New York city. He must pass an entrance examination in writing, spelling, the English language, arithmetic, elementary propositions in geometry, geography, the history of the United States, and the elements of industrial drawing.

Instruction is free, and free text books and apparatus are supplied. The cost of instruction is nearly $3,600 per annum. The total cost of shop plant, in report of October 31, 1888, is reported to have been $8,640.06.

The Hebrew Technical Institute of New York is a manual training school. It was organized in 1884. This institute is *sui generis*, and, within the prescribed limits, it is one of the most thorough among the training schools of the country. Pupils are required to be 12½ years of age and to pass an examination in arithmetic, English, geography, and history.

The course of instruction is embraced in three departments, viz., shop work in wood and iron; drawing, free-hand and mechanical; the English branches and physics. Pupils attend during the hours which constitute the school day, from 9 a. m. to 5 p. m. with an intermission of one hour at noon, and are instructed in all the departments.

The course of study in this institution is arranged on the basis of general instruction in the use of tools, drawing, and the general branches to cover a period of two years, the third year to be devoted to preparation for some special branch.

The relation between the drawing and shop departments is very close, while the mathematics taught in the English department should be practical and bear upon the shop work. The English department includes instruction in the following branches: Arithmetic, geometry, history, geography, reading, writing, language lessons, physics, and industrial topics.

The drawing department includes free hand drawing (model and object and decorative drawing) and mechanical drawing.

The shop work includes wood working and metal working. Under wood working, the following are the stages: Pasteboard work, bracket sawing, construction work in bracket sawing, preliminary exercises in the use of saw, try-square, and chisel; exercises in nailing and use of hammer, joinery, construction work, wood carving, patternmaking, moulding and casting. Metal working should commence with exercises in tin and soldering, light work on speed lathe, forge work, chipping and filing, engine lathe work, shaper and planer, drill press, and construction work. The metal working shop is equipped with 2 engine lathes, 2 drill presses, 2 speed lathes, 1 planer, and 15 vises, with all the necessary tools used with such machines. The vise work teaches the properties of cast iron, the use of the hammer, chisel, file, straight-edge, calipers, square, bevel, gauge, and dividers.

By the end of the second year the special aptitude of the pupil is evidenced, and arrangements are then made for a lengthy stay each day in that shop which will prepare him for his special trade. Thus the pupils in the wood working department, in the third year, devote their entire time to wood working, either patternmaking, cabinetmaking, or carpentry and drawing, while those who show an aptitude for machinery devote their entire time in the metal working shop and mechanical drawing (one hour a day only being given to physics and mathematics). Those who show a desire to engage in electrical work receive special instruction in that branch.

Instruction, books, and tools are furnished free. The number of pupils at the date of the latest report (January 1, 1891) was 146. The first class was graduated from this school in 1886. Henry M. Leipziger, Ph. D., is director of the institute, and there are seven instructors associated with him. The whole number of graduates (including the class of 1890) is 62, namely, in the class of 1886, 18; in the class of 1888, 11; in the class of 1889, 17; in the class of 1890, 16. Of these 6 are connected with electrical works, 3 are architects, 2 are machinists, and 1 is engaged in the telephone business. Most of the remaining graduates are employed by business firms concerning whose line of trade information is not available.

The Industrial Education Association of New York, in addition to publishing educational monographs from time to time, instituting lecture courses, and seeking in every way to create an interest in all educational work and to diffuse a knowledge of any advance in pedagogical science, has founded a college for the training of teachers, tuition for a full year's course in which costs $60. This college was opened in 1887, and in connection with it a model school for boys and girls.

In this school (consisting of a kindergarten and a primary and a grammar grade), besides the branches usually taught in the public schools, industrial drawing, clay modelling, and the use of tools are taught. The course for girls includes a graded system of sewing and cutting, together with a course in cookery.

The work of this association has been merged in that of the New York College for the Training of Teachers.

Dr. Felix Adler's Workingman's School in New York city was founded in 1878. Instruction is gratuitous for the children of the poor, for whom the school is primarily intended. The enrollment in 1892 shows an attendance of over 360 pupils.

The Society for Ethical Culture maintains the school, which is entirely unsectarian and receives pupils of both sexes and all nationalities between the ages of 3 and 14 years. The full course covers a period of 11 years. Since this year's term 28 pay pupils have been admitted to the school, who add about $2,800 to the funds of the society, which requires $22,000 annually to defray the expenses of the institution.

This school is an excellent example of the application of manual training methods through all grades of instruction, from the kindergarten to the high school. A normal course for kindergartners is now provided in a department of this school.

OHIO.

The Technical School of Cincinnati was opened for the admission of pupils in November 1886. It is an incorporated institution and under the management of a board of trustees. The faculty is composed of a director and 8 teachers; 3 are shop instructors, 4 class instructors, and 1 takes charge of the draughting department. Since 1887 about half the expense of the school has been borne by the Commercial Club.

Pupils are admitted at 14 years of age, on certificates of grammar school principals, or after passing an examination in the English branches commonly taught in the grammar school.

The course of study and shop work in this school requires three years for its completion. The first year subjects are algebra, arithmetic, elementary science, physiology; English language, history, American literature; free-hand, outline, and model drawing; shop details, simple projection and geometrical construction; proper care and use of tools, carpentry, joinery, and wood turning.

The second year studies include geometry, chemistry, English language, English history and literature; shop details, orthographic projections, isometric projection, principles of perspective, development of surfaces, machines from measurement; forging, welding, tempering, and tool making.

In the third year the course comprises higher algebra, plane trigonometry, physics; English language, civil government, political economy, or German; machine drawing, general plans, detailed working drawings, shop details, or architectural drawing, interior decorations, buildings from measurement, architectural perspective; chipping, filing, fitting, turning, drilling, planing, milling, construction of some machine or machines. .

One-half of the pupils' time throughout the entire course is devoted to manual work, viz., two hours to shop work and one hour to drawing. The remaining half (three hours) is given to mathematics, sciences, and language equally.

Tuition for the course of study is as follows: First year, $75; second year, $100; third year, $125.

The carpenter shop of this school is equipped with 52 cabinetmakers' benches, 15 speed lathes, 1 rip and cross-cut circular saw, 1 grindstone, 2 emery wheels, bench tools for 90 boys, turning tools for 42 boys.

The blacksmith shop has 19 forges, 19 anvils, 2 vises, 1 blower, 1 exhaust fan, 1 bellows; tongs, hammers, flatters, fullers, swages, etc., for 54 boys.

There are now enrolled 152 scholars, of whom 72 are in the first year, 38 in the second, 25 in the advanced year, and the remaining 17 in preparatory or special classes. Of the whole number, 29 enjoy the privileges of free or partially free scholarships, while from the remainder is received the sum of $10,500 in tuition fees.

At Cleveland, as early as February 1885, instruction in carpentry was begun for the benefit of a few boys of the Central High School. The interest which these pupils showed in the work attracted the attention and enlisted the sympathy of certain business men of the city, who at once formed a stock company with a capital of $25,000, and were incorporated June 2, 1885, under the title of the Cleveland Manual Training School Company.

The school was opened for pupils early in February 1886. The state legislature soon after authorized the levying of a tax of one-fifth of a mill for the purposes of manual and domestic training. This tax amounts to about $16,000; and so manual training found its way into the public schools, all pupils being entitled to free tuition.

On entrance pupils must be 14 years old and fitted for the high school; otherwise they must pass a written examination.

The course of study in the Cleveland Manual Training School is briefly as follows:

First year.—Free-hand, geometrical, and mechanical drawing; carpentry, cabinet work, patternmaking, moulding, casting, care and use of tools, etc.

Second year.—Geometrical and mechanical drawing; forge, vise, and machine work in iron and steel.

Third year.—Mechanical drawing; machine work in metal, tool making, etc.

Each lesson lasts three hours, and three lessons a week are required of each pupil. Six hours a week are spent in the shop and three hours at the drawing lessons.

In September 1887, a cooking department was added to this school. The course in cooking for one term is as follows:

First week: Lamb chops, cranberries, mashed potatoes, oatmeal, baked apples.

Second week: Potato soup, scrambled eggs, turnips in white sauce, apple tapioca.

Third week: Fish balls, milk toast, apple shortcake, coffee.

Fourth week: Mixing and baking bread and biscuit, tomato soup, steamed rice.

Fifth week: Oyster stew, corn cake, toasted crackers, griddle cakes, lemon sirups.

Sixth week: Corned beef hash, frying out fat, rye muffins, doughnuts.

Seventh week: Beef stew, dumplings, chocolate, cookies.

Eighth week: Creamed cod fish, French toast, cottage pudding, sauce.

Ninth week: Collops or Hamburg steak, lyonnaise potatoes, apple pie, gingerbread.

Tenth week: Green pea soup, fried fish, potato balls, floating island, plain cake.

The total number of students in the three classes of the school, in June 1891, was 172. Of these, 25 were in the third year class, 47 in the second year, and 100 in the first year. The whole number of graduates at the same date was 35. Seven had already gone into business and the remainder were pursuing advanced studies.

Toledo has a famous manual training school, from which 14 students were graduated in the summer of 1889, the fifth year of the school. Of the graduates, 6 were boys, 8 girls. Mr. George S. Mills, superintendent of the training school, agrees with other promoters of manual instruction when he says, "It is already proved that the manual training school has a tendency to keep boys in the high school." The course covers four years, the pupils' time being about equally divided between mental and manual exercises. Forty-five minutes per day are given to drawing, and from three-quarters to one and a half hours to shop work.

For residents of Toledo instruction in the manual training school is free; a small charge for material only being made as follows: For boys, the first year, $6; the second year, $7; the third and fourth years, $9 each. For the girls, the first and second years, $6 each; the third and fourth years, $9 each.

Of the 22 graduating in 1888, 16 are filling positions as machinists, designers, draughtsmen or draughtswomen, instructors in shop work, domestic economy, etc. The class of 1889 was smaller, numbering 14. Of these, 1 has secured employment as a machinist, 1 as draughtsman for an engraver, and 1 as draughtswoman for a sanitary engineering firm. Seven, or one-half of all, have found positions to work.

The department of domestic economy in this school is designed for the training of girls in applied housekeeping. The studies are identical with those pursued by boys of the same grades, except that other forms of manual instruction are given.

Thus, in the first year's course, the girls of the senior grammar class take lessons in light carpentry, wood carving, care and use of tools, and wood finishing. The second year embraces introduction to courses in plain sewing and garment cutting and making. The third year's course embraces instruction in preparing and cooking food, purchasing household supplies, and chemistry of cooking. The fourth year, the girls receive lessons in cutting, making and fitting garments, household decorations, millinery, etc.

The practical nature of the instruction given in the department of cookery may be inferred from the following programme:

Boiling.—Illustrations of boiling and steaming, and treatment of vegetables, meats, fish, and cereals, soup making, etc.

Broiling.—Lessons and practice in meat, chicken, fish, oysters, etc.

Bread making.—Chemical and mechanical action of materials used. Manipulations in bread making in its various departments. Yeasts and their substitutes.

Baking.—Heat in its action on different materials in the process of baking. Practical experiments in baking bread, pastry, puddings, cake, meats, fish, etc.

Frying.—Chemical and mechanical principles involved and illustrated in the frying of vegetables, meats, fish, oysters, etc.

Mixing.—The art of making combinations, as in soups, salads, puddings, pies, cakes, sauces, dressings, flavorings, condiments, etc.

Marketing and economy.—The selection and purchase of household supplies. General instructions in systematizing and economizing household work and expenses. The anatomy of animals used as food, and how to choose and use the several parts. Lessons on the qualities of water and steam; the construction of stoves and ranges; the properties of different fuels.

The textile fabric work will include garment cutting and making, the economical and tasteful use of materials, millinery, etc.

PENNSYLVANIA.

The Philadelphia Manual Training School, Seventeenth and Wood streets, opened in September 1885, has a faculty of thirteen professors and instructors. Like the Chicago school, it affords to pupils opportunities to pursue the usual high school course in literature, science, and mathematics, combined with a thorough course in drawing, and in the use and application of tools in the industrial arts.

The course of study lasts for three years. One hour a day is devoted to drawing, two hours to shop work, and three to academic studies. The school has chemical, electrical, and physical laboratories, drawing and modelling rooms; and, in its mechanical department, wood working shops with 54 cabinetmakers' benches, each supplied with a full set of tools, and metal working shops with 12 forges and as many anvils, 36 vises with full equipment of tools, appliances for foundery work, etc. In the senior class are 70 students; in the middle class, 111; and in the junior, 138.

The Northeast School, Howard street, opened in 1890–'91, has a faculty of nine professors and instructors. The equipments are similar to the Seventeenth and Wood streets school. It has 214 students enrolled in its different classes.

In the spring of 1882 a beginning of manual instruction was made at Girard College in the branch of metal work. The experiment was successful, and it was decided to build more ample quarters for the work. Accordingly, a building 55 by 155 feet and two stories high was put up on the college grounds, and, on December 9, 1884, opened for pupils. Since that date the use of wood working tools has been taught

in this institution, and foundery work and blacksmithing have been introduced. Pupils are also taught mechanical and geometrical drawing.

Prior to the introduction of wood working in 1884, according to the report of the trustees, only one-third of the boys on leaving college entered mechanical pursuits. Since that event two-thirds of the boys have obtained employment at mechanical occupations.

In the report and catalogue for the year 1890, President Fetterolf says:

Manual training prepares boys for the learning of a trade just as academic training prepares young men for professional study.

This remark defines the use and the limitations of manual training, in its relations to skilled labor, with clearness and, apparently, with absolute justice. Manual training is merely preparatory discipline of the eye and hand, not trade teaching.

Vice-President Gregory writes, June 20, 1891:

Our pupils upon reaching certain classes are expected to attend the instruction in the mechanical department as regularly as that in arithmetic, or in any other study.

There is an industrial annex of the public schools at Tidioute in which several phases of manual training are made available for educational purposes. There are five departments of the work, indicating a very thorough organization:

First. The primary department, where kindergarten methods prevail.

Second. The drawing department. Mechanical drawing is taught in all grades, including the high school.

Third. Floriculture, or the department of practical botany. In this department are arranged, in various ornamental designs, six beds 30 by 40 feet; and the care of one of these is assigned to each room. Both boys and girls work at gardening, and learn something of the methods of cultivation of different varieties of plants.

Fourth. The girls' department of domestic economy.

Fifth. The boys' department of wood working, etc.

In each of these departments the course embraces the work of three years.

The workshop for boys is furnished for the practice of carpentry, wood turning, and work in tin, iron, etc. During the first year the boys work at carpentry in a shop furnished with 10 double benches, each of which is supplied with 2 vises, a centre board, on each side of which hang 1 cross-cut saw, 1 rip-saw, 1 back-saw, 1 hammer, 1 bevel square, 1 try-square, 1 mallet, 1 pair of compasses, 1 gauge, 1 oilstone, 1 oil-can, and 1 whisk broom. In the second year the wood lathe is used by the boys, and metal work comes in the final year.

Wilkes Barre is "the only city in northeastern Pennsylvania in which manual training forms a part of the public school system," says

Mr. A. W. Potter, district superintendent of schools, in the sixth annual report (1888–'89).

The cost of the plant is as follows: Tools, $75.50; benches, vises, stops, etc., $59.49. An expert instructor in joinery is secured for two half days each week at a salary of $16 a month.

The course consists of the making of 20 models, viz., chiselling square and mitre cut; halved corner; ledge joint; cross-lap joint; mitre joint; mitre-lap joint; square butt; slip mortise and tenon; through mortise and tenon; secret-slip mortise and tenon; blind mortise and tenon; brace-joint mortise and tenon; halved dovetail; keyed dovetail; dovetail butt; through dovetail; through end dovetail (one tenon); through end dovetail (three tenon); drawer dovetail; bevel dovetail.

In November 1888, sewing was introduced, as a form of manual training for girls, into the fourth, fifth, sixth, seventh, and eighth year grades of the Wilkes Barre schools. Friday afternoons from 3 to 4 o'clock were selected for instruction in this work. The regular teachers being required to give the instruction in sewing, it became necessary to have a well defined course and a set of models. The course outlined and illustrated by the Industrial Education Association of New York city was adopted. The instructions are explicit and the models examples of accuracy and neatness.

There are 20 models used in this course also, viz., overhanding or top sewing on striped calico; overhanding on white muslin, two selvages; turning hem on colored paper; hemming on unbleached muslin with red thread; running by a thread; hemming on white muslin; overcasting; felling on unbleached muslin; felling on bleached muslin; gathering; buttonholes and buttons; gusset; herring-bone stitch on flannel; stocking darning; darning on cashmere; patching; tucking, whipping, sewing on ruffle; feather-stitch; sampler; making simple garments.

RHODE ISLAND.

In Rhode Island several cities have taken up manual training to a greater or less extent. During 1890 an industrial school for girls, which as a private enterprise had experimentally introduced sewing, dressmaking, and cooking into some of the public schools, was incorporated with the public school system of Newport, the city voting to appropriate $3,000 yearly to its support. There is a dressmaking department and a cooking department, with a special teacher for each. Providence has been giving instruction in sewing to a large number of the girls in her schools. During the year 1891 out of $500,000 appropriated for new school buildings one-sixth was for a new manual training school. The new building will be thoroughly equipped for work in wood and iron, including blacksmithing. At Westerly drawing, stick laying, and modelling have been adopted in the various grades, and the results of the work are giving much satisfaction to the teachers.

SOUTH CAROLINA.

South Carolina has a number of schools for colored students in which some manual instruction is given. In the Schofield Normal and Industrial School, at Aiken, about 200 pupils of both sexes receive instruction in sewing, carpentry, and printing as a means of discipline and education. In Porter Academy, at Charleston; Brainard Institute, at Chester; Benedict Institute and South Carolina University, at Columbia; and Claflin University, at Orangeburg, some degree of manual training is maintained. In the Winthrop Training School for Teachers, at Columbia, teachers are prepared for the teaching of elementary manual exercises in connection with their other duties. The instruction given here consists of paper folding and cutting, pasteboard work, clay modelling, and map moulding in sand and clay.

TENNESSEE.

At Knoxville a manual training course has been introduced into the public schools. The branches taught are carpentry, printing, sewing, and cooking.

Knoxville College is under the care of the United Presbyterian Church of North America, and is sustained mainly by contributions from the various congregations through the Board of Missions to the Freedmen. In its industrial department the ends of economy and readiness for life work are sought through industrial training. Housework, sewing, printing, and tool and machine work are the special subjects of instruction, together with gardening and farming.

The catalogue states that a new building was to be completed in September 1891, and in readiness for the opening of the term. This building will contain shops for work in wood and iron, drawing rooms, and laboratories for chemistry, botany, and agriculture. The building will be equipped with a boiler and engine and the necessary machinery and tools, and the laboratories will have a good outfit of apparatus.

Le Moyne Normal Institute, at Memphis, places manual training in the course of study on the same footing and treats it in every respect as of the same importance as any other branch of study. The girls of this school are taught needlework in all of its branches. Cooking, household hygiene, and nursing are also included in the course. The work comprises recitations and practice through ten years of the course of study.

Wood working, typesetting, and printing are for the boys. The equipment of the wood working shop consists of 14 benches and as many sets of carpenter's tools. There are also several lathes in the shop. In the printing office the work has proved very successful, both in practical results and as a valuable auxiliary in the intellectual training of the school. The number of pupils for the year 1890–'91 was 708.

The Central Tennessee College, of Nashville, is an institution supported by the Freedmen's Aid and Southern Education Society of the Methodist Episcopal Church. It has an industrial department, and, by the aid of the John F. Slater fund, it is enabled to give instruction in printing, carpentry, blacksmithing, tin work, wagon making, cooking, sewing, cutting and making garments, and millinery. Connected with this college there is a department of mechanical art training, whose course of study occupies four years, and may be specialized by students desiring to learn a particular trade.

Manual training has recently been introduced into the course of Fisk University, Nashville. Printing and shop work practice are the means used to secure the ends sought. The course runs through three years. Two hours each week are given to working in wood. The young women are taught nursing and hygiene, cooking, dressmaking, and plain sewing.

In the Morristown Normal Academy a moderate amount of manual training is given to the pupils. Girls are instructed in sewing, dressmaking, millinery, and housekeeping in all its departments. The young men learn something of typesetting and printing.

TEXAS.

There is a department of industries in connection with Bishop College, Marshall. Students are required to work one hour each day at some kind of manual labor. A carpenter shop, a supply of tools, and an instructor have been provided, and a class of young men have been taking lessons in the elements of carpentry and the care of tools. The young women assist in the boarding department in preparing food for cooking, etc. They are also taught to sew.

At Wiley University, also located at Marshall, sewing, dressmaking, millinery, and nursing, with the whole art of housekeeping, are taught to young women, and printing office work is made available as a means of education to young men. It is an institution for colored people.

VIRGINIA.

The Miller Manual Labor School of Albemarle, at Crozet, Albemarle county, is a school founded for the education of "poor orphan and other white children whose parents shall be unable to educate them, the said orphans and other children being residents of the said county of Albemarle," according to the terms of the will by which Samuel Miller bequeathed over a million of dollars for the establishment and support of the Miller Manual Labor School. The fund so devised is held in trust by the Virginia board of education, and the school is managed through the agency of the Albemarle county court.

From a list of children eligible (under the will of Mr. Miller) to membership the court appoints the pupils of the school. None but residents of Albemarle county can be appointed; but those that secure appointment are clothed, fed, taught, and cared for by the school.

The first pupils were admitted to this school in October 1878, twenty in number. It was at first hard to persuade the friends of the children to allow appointments to be made under the conditions imposed by the Miller testament; but in 1892 there was an enrolment of 266 pupils.

In August 1884, a department was organized for the instruction of girls; and the first girls were admitted to the school in November 1884.

Most pupils enter the primary department of the school, not being sufficiently advanced to begin in the higher grades. In the academic department there are five classes, each of which is given one year. The courses of study for the boys and girls are different.

The boys' course is as follows:

Fifth (lowest) class.—Arithmetic, English, reading and dictation, physical geography and scientific knowledge, farm work, printing, and free-hand drawing.

Fourth class.—Algebra, English, Latin, zoölogy and botany, wood work, farm work, free-hand drawing, and bookkeeping.

Third class.—Algebra, English, Latin or German or French, botany and physiology, mechanical drawing, foundery and forge practice.

Second class.—Geometry, physics, Latin and German, chemistry, mechanical drawing, and shop practice in iron work, or laboratory work in either chemistry or biology.

First class.—Trigonometry, mechanics, Latin and German, agriculture or industrial chemistry or mineralogy and geology, mechanical drawing, special shop practice or laboratory work in biology, and chemistry or physics.

The girls' course includes—

Fifth class.—English, arithmetic, reading and dictation, physical geography and scientific knowledge, plain hand and machine sewing, housework, and free-hand drawing.

Fourth class.—English, arithmetic, Latin, zoölogy and botany, dressmaking, cutting and fitting, housework, and free-hand drawing.

Third class.—English, arithmetic and algebra, Latin or German or French, botany and physiology, dressmaking, cutting and fitting, housework, cooking, and wood carving or designing or free-hand drawing.

Second class.—Chemistry, algebra and geometry, Latin and German, physics, dressmaking, cutting and fitting, housework, cooking, and wood carving or designing or drawing, or laboratory work in chemistry or biology.

First class.—Literature, geometry, Latin and German, industrial chemistry or mineralogy and geology, dressmaking, cutting and fitting, housework, cooking, and wood carving or designing or drawing, or laboratory work in chemistry or biology.

Some interesting details of the work of the school have been drawn from its report. The unique character of this institution justifies a somewhat extended notice of its courses.

The course of instruction in the wood working department of the Mil-

ler school requires that 12 hours per week for 40 weeks shall be devoted to this branch. Of these 480 hours, 80 are devoted especially to carpentry and joinery, 80 to turning, and 80 to carving. The remaining 240 hours are equally divided between cabinetmaking and patternmaking.

Carpentry and joinery.—Instruction in this branch is given in the bench room. The use and care of tools are taken first. The principles upon which such are constructed and some of their uses are thoroughly explained. These are illustrated by exercises specially designed to show the use of the tool under consideration. The exercise is explained to the class by the instructor, after which each member is required to do it himself. After an exercise or exercises have been given on each of the tools, instruction is given in the construction of a number of joints used in framing buildings, etc. One of each of these is made by each member of the class.

From the first the class is taught to work from drawings which are put upon the blackboard. Unless each exercise is reasonably well made, the pupil is required to do it again and again, if necessary, till it is done with reasonable accuracy. The classes are also taught to keep the tools in order.

Turning.—In the same manner as before the use and care of each tool are taught. After a number of exercises illustrating the use of the tools are given and completed, designs of various styles are given, becoming more difficult as the members of the class become more skilful. A number of exercises is given in face-plate and chuck work.

Carving.—This is taught in the same manner as the other two, the designs given becoming more elaborate as the members of the class become better acquainted with the use of the tools.

Cabinetmaking.—This is the actual manufacture of useful articles of furniture. In this branch the pupil has the opportunity to apply the principles taught in the three branches which go before. Particular attention is paid to the way in which the work is put together. As the sole object is to teach and not to make money, no time and pains are spared to see that the work is not simply for outward appearance. Every piece which is accepted is substantial and well made throughout.

Patternmaking.—As it requires a lifetime to become skilful in this branch of work in wood, and as it is impossible to be an expert patternmaker without understanding the art of moulding, only a few of the underlying principles can be taught. The class is taught how to make a number of small patterns, core-boxes, etc., while at the same time the method of moulding each one is thoroughly explained.

Forge and foundery work.—The first things taught in the brass foundery are the names of the different tools and how they are used. The student is then shown how a mould is made and where mistakes are likely to occur, and what effect these mistakes would have on the finished casting. As soon as these things are thoroughly understood

the student is given the simplest kind of pattern and is required to mould it. When successful he is given a pattern which is a little more difficult, and so on until he has become tolerably proficient in the moulding of small articles. He is then required to cast his moulds, first in zinc, on account of its low melting point and the ease with which it can be handled, and then in brass. At this point instruction is given in the mixing of brass and bronze, showing what mixtures will produce a hard, soft, or fluid alloy, as may be required. The time spent in the brass foundery is about five weeks.

The class then goes to the iron foundery, where instruction is given in snap moulding, moulding in large flasks, ramming, venting, the use of gaggers, chaplets, core-making, facings, their composition and how and when to use them, where lines of weakness in castings are likely to occur, the elements of dry and loam sand moulding, and other subjects which come up during the course. After the above is thoroughly understood, instruction is given in the construction and management of the cupola, each boy in turn being required to take charge of a melting.

Among the things made so far this session, 1891–'92, are the castings for 12 wood working lathes, 1 slate machine, 1 rattle barrel, 10 stop cock boxes, 10 wash room sinks, 1 ton grate bars for boiler room, 20 cast iron steps for stairs in main building, 1 circular stairway for engine room, and several tons of other castings which were made for practice and have been remelted.

Blacksmith work.—In order that the student may get a correct and rapid idea of form and proportion, and also thoroughly familiarize himself with the use of the hammer, the first operations in forging are performed in lead instead of iron, which acts under the hammer very much as hot iron does and permits the operations of forging with the exception of welding and upsetting. The time devoted to lead work is about 30 hours.

The use and care of the fire is then taught, the different kinds of fires, and which to use for certain kinds of work. Good work can not be done without a good, clean fire; therefore the importance of this is carefully impressed on the student's mind.

Next follows a systematic course of drawing, upsetting, bending, punching, and welding. Before finishing iron forging each student is required to make a set of tongs for the use of the next class.

Metal work.—Regular instruction in this department is given to No. 2 class on the first three days of the week, four hours each day, during the whole session. Special instruction is given to those members of No. 1 class who desire to take a fuller course than that given in the regular way.

Instruction is given in bench and machine work in cast iron, wrought iron, steel, and brass, by means of a course of graded exercises embracing the principles of machine construction. Each exercise is supplemented by something of mechanical value.

Before commencing work on any machine a thorough explanation is given to the class of the methods of operating and adjusting all parts, giving the technical terms used to distinguish them. In this division instruction is given in chipping, filing, scraping, polishing, measuring, graduating, drilling, reaming, etc.

One boy is detailed from the metal working class each week, who is engineer for that week, and he is required to give all necessary attention to the engines, besides taking indicator cards each day, setting valves, calculating horse power, etc.

The industrial training of the girls' department consists in instruction and practice in dressmaking, including cutting and fitting by measurement, plain hand and machine sewing, cooking, housework, stenography, typewriting, bookkeeping, wood carving, and drawing.

In the sewing department the girls are divided into four classes according to age, and each class in turn is taught all the different kinds of sewing, from darning stockings to cutting, fitting, and making a stylish dress. The first class is instructed in dressmaking, including cutting and fitting by measurement, and has ample practice in this line by actually cutting and fitting their own dresses and the dresses of other girls. The second class has for its specific work the making of the most difficult parts of garments which have been cut and fitted by the first class, and begins the rudiments of cutting and fitting. The third class receives instruction and practice in plain hand and machine sewing, and does the plain sewing for the department. The fourth class, or youngest, is taught to hem, fell, backstitch, and to make buttonholes, and does the darning and mending for the department. In addition to the foregoing lines of sewing, the girls learn to make a great variety of fancy articles in crochet work and embroidery. It will be seen from the above that as a girl grows older she learns all the different kinds of sewing, and that the practice in these results in the doing of a great deal of work which would otherwise have to be hired out.

The girls have constant practice in house cleaning, such as scrubbing, dusting, sweeping, fire making, and dining room work, including dish washing, setting tables, cleaning silver, etc.

In the cooking department the girls are instructed and practised in preserving, pickling, and canning fruits and vegetables.

Other branches of manual training are taught to the girls, such as modelling and wood carving.

A garden of 50 acres is cultivated by the pupils, and each boy learns the best methods of planting, fertilizing, and tending vegetables and small fruits. The farm connected with this school yielded the following products in the year 1891: Hay, 124 tons; corn, 2,650 bushels; oats, 80 tons; ensilage, 176 tons; pork, 9,762 pounds; milk, 119,828 pounds.

In the school year 1891–'92 there were on the roll of the school 173 boys and 93 girls. The whole number of those who have enjoyed the

benefits of the school since its organization is 592—469 boys and 123 girls.

The published report of the school gives a list of the graduates, with post office address and occupation of each. The total number of graduates reported is 305. Of this number 23 have died, and in the case of 42 the occupations are unknown. Below we give a summary of the occupations of the remaining 240.

OCCUPATIONS OF GRADUATES OF THE MILLER MANUAL LABOR SCHOOL.

Occupation.	Graduates.	Occupation.	Graduates.
Blacksmiths	2	Laborers	31
Brakemen	7	Machinists	27
Bricklayers	7	Painters	2
Cabinetmakers	7	Printers	5
Carpenters	13	Professors (chemistry, mechanical engineering).	3
Clergymen	2	Students	9
Clerks, bookkeepers, etc	32	Superintendent, cotton mill	1
Draughtsmen	6	Teachers	6
Engineers, civil	5	Telegraph operators	4
Engineers, electric light	5	Miscellaneous	37
Farmers, etc	23		
Firemen	3		
Founders	3	Total	240

Industrial training for young women is provided for in Hartshorn Memorial College of Richmond. This does not mean a training for servants in the kitchen, the chamber, or the laundry, but rather in that knowledge of common things, that disciplined attention, that training of the eye, that cunning of the fingers, which makes the mastery of all things possible.

The instruction includes the physiology and hygiene of woman's physical life; the sanitary and housewifely care of a house—of the sleeping rooms, of the kitchen and pantry, of the bath room, of the cellar, of the parlor; plain sewing, patching, darning, knitting; the arts of the laundry; the use of detergents; soap making; plain cooking; bread making and bread raising preparations; the selection and cooking of meats; of vegetables; cake and pastries; healthful and unhealthful foods; economy in cooking; the principles of nursing and the care of the sick; cooking for the sick; causes and prevention of sickness; the care of clothing; of cotton and linen; of woollen, silks, and furs; the cutting and fitting of plain garments; principles of health and of taste and beauty in dressing; decorative needlework and knitting; the care of children.

The president, the Rev. Lyman B. Tefft, writes under date of July 20, 1891: "Our industrial training is incidental to our training of teachers and religious workers."

WISCONSIN.

The State Normal School at White Water employs manual training as an adjunct of educational work.

A small workshop, begun a few years ago as an experiment, affords limited means for instruction and practice in the use of wood working

tools, and has proved a valuable adjunct of the scientific department. Members of the class in physics spend 4 hours each week, for 20 weeks, in learning the use of the fundamental tools and how to construct simple apparatus.

The State Normal School at Milwaukee also adopts manual training to a limited extent. Boys from the model school of this institution receive instruction in sloid. This is an admirable exemplification of the adaptability of carpentry to the lower grades of the public schools. There is opportunity offered, also, to students of the normal school to participate in this work.

CONFERENCE ON MANUAL TRAINING.

The conference on manual training held in Boston, April 8–11, 1891, may here receive appropriate notice. This we believe to have been the first general conference in America on this subject, but the report of the proceedings indicates that the teachers of the United States have well matured thoughts concerning the question, and that many of them have had experience in the new educational movement which qualifies them to speak with some authority, and entitles them to a respectful and attentive hearing. It is fortunate that the papers read at the several sessions of the Boston gathering have been collected and published in full, together with a phonographic report of the discussions called forth by the essays presented.

The conference was held in the English High School building at Boston. It was called to order by Mr. Edwin P. Seaver, and presided over by Dr. Samuel Eliot, who, in his opening address, said with pertinence and force:

> Manual training is to be judged by its results, and the results gathered together here will persuade a great many persons that it is worthy of a far more respectful consideration than it has yet received.

Governor Russell was then introduced. He spoke briefly of the Rindge Manual Training School of Cambridge. This school provided, he said, that—

> Boys upon graduation from the grammar school, at the age of about 13 or 14, should have the option to enter the manual school and get manual instruction in connection with high school studies. Their time was divided between the two schools. At the high school they pursued the usual studies, such as mathematics and physics, and at the manual school they were taught carpentry and joinery, forging, machine work, patternmaking, drawing, and other manual studies. * * *
>
> Such education should be made a part of our public school system, open to all * * * then making it optional to the pupil, rather than compulsory.

President Eliot, of Harvard College, spoke in his usual incisive manner. He said in part:

> I am old enough to remember when the brain was supposed to be the seat of the mind, just as the lungs were held to be the furnace that warms the body. I remember being taught that the animal heat

was kept up in the lungs, but we all know better now. We know that wherever an atom is consumed, in whatever part of the body, there heat is generated, and, therefore, that the animal heat pervades the whole organism. It is just so with regard to the human mind; it pervades the body. It is not in the head, but it is all over the body; and, when you train the hand, or the eye, or the ear, you train the mind. As Governor Russell said, manual training is mental training. Never admit that manual training is anything distinguished from, or in opposition to, mental training. In the skill of the artist's hand, in the methodical, accurate movement of the mechanic's arm, in the acute observation through the physician's eye or ear, there is always mind. Therefore, there is no opposition between manual training on the one hand and mental training on the other. We are simply training another kind of faculty—not memory, but discriminating observation and correct perception. * * *

Manual training is in the experimental stage. We have not yet learned whether carpentry is a better means of giving training in correct observation and in the nice use of finger and eye than chemical experimentation or physical experimentation with instruments of precision, such as are now used even in elementary instruction. I do not think the better way is as yet demonstrated, but teachers and students are pushing these inquiries in high schools, manual training schools, and scientific schools, and are in a fair way to arrive, in time, at just conclusions.

Dr. Felix Adler made an address at the second day's session, on the Educational Value of Manual Training in the Public Schools. We quote a few of his suggestive utterances:

Manual training has a history in other countries outside the United States, and if we consult the French experiment we shall be impressed by the degree of success which has already been achieved in that country. The very fact that manual training is being rapidly introduced into many of the French public schools is a remarkable testimony in its favor, because the system there is not guided after the haphazard fashion of this country, where every town has its own board of education, and where those boards are not usually composed of experts.

The educational system of France is governed by a national council, consisting of some of the most eminent men of science to be found in that country. Every step that is taken is carefully and fully considered, every trifling innovation is the subject of earnest investigation. If, therefore, manual training has met with remarkable success in France, that is testimony in its favor which should not be ignored.

Other interesting addresses were made by distinguished educationists; but we have space to introduce only a few specimens of the wise and weighty utterances with which the volume containing the report is filled.

For example, when Mr. D. W. Jones, master of Lowell School, Boston, said, "We welcome this manual training just so far as it is an educational power, and no farther," he expressed, in the most concise terms, the prevalent idea of the teaching fraternity as to the proper function and the limitations of manual instruction.

So, too, when Col. T. W. Higginson said, in his pregnant speech:

We recognize that the whole thing is as yet only half developed. We must go away with that understanding, that each locality has got to work it out in detail for itself, to try its own experiments, avail itself of its own failures, take its own material, use it as it can, and by and by it will be developed into something like a cohesive and systematic form, as our regular high school training may be said to be by this time, where men are working on the same lines and know what those lines are. In manual training we are all working experimentally.

In the profound and carefully prepared paper of Prof. S. N. Patten, of the University of Pennsylvania, also, the necessity of teaching domestic economy in our public schools is urged with peculiar eloquence. We quote one of his remarks on this subject:

In better economy of what we produce, we have a key to our industrial problems; and here, more than anywhere else, our practical endeavors can produce results if we work up the matter systematically. Give the laborers an education of the kind which will have a direct influence upon their consumption, and the solution of other educational problems will be much simpler than it now is.

The address of Prof. C. R. Richards, of the Pratt Institute, on Means and Methods of Manual Training, and the historical sketch of the Origin of Mechanic Art Teaching by Prof. J. D. Runkle, of the Massachusetts Institute of Technology, are exceptionally rich in suggestiveness; and this is true, also, of the valuable paper read by Prof. Robert H. Richards, of the Massachusetts Institute of Technology, on Manual Training as an Inspiration to Mental Development, in which the author recalls some of his own personal experiences by way of illustration.

We can not refrain from copying the sententious expression of the Rev. C. G. Ames, who, in the closing address, said: "The best part of our education comes not so much from knowing as applying knowledge to action;" a thought whose full import should be felt in schools of every grade and kind.

The discussions at the Boston conference embraced a wider range of topics than the reporters at the German congresses have usually considered, at least, in recent years. The reason is, doubtless, that debate on the subject is more of a novelty with us than with the people of continental Europe, where every phase of the question of manual training has been under investigation for years, and where settled conclusions have been reached concerning many matters, which, in America, are yet *sub judice*, and which, moreover, in this country involve other conditions and require more careful adjustment than under European governments.

TRADE AND TECHNICAL SCHOOLS.

Totally different from the manual training schools in aims and methods are the institutions of a trade and technical character. The manual training school, as has been seen, aims at directing, by courses of mental and manual exercises, the development of all the powers of

the individual, the single educational purpose being always kept in view. The trade and technical schools, on the other hand, aim at such special development as will give a mastery of some particular craft. Unlike many of the manual training schools none of those for trade and technical training are parts of the public school system. The School of Industrial Art at Philadelphia is the only one of its class, so far as known, that has received any assistance from a state appropriation. But no extended summary of the aims and characteristics of the trade and technical schools need be made. Schools of these classes are not so numerous, nor their methods so various, that any elaborate analysis is necessary to make clear the differences in their aims or in the work for which they are organized. All this will be easily understood by comparison of the statements for the several schools.

NEW YORK TRADE SCHOOLS.

In 1881 the New York Trade Schools were established in New York city, at the corner of First avenue and Sixty-eighth street, by Col. Richard T. Auchmuty, a gentleman of means who has given much attention to labor problems. His investigation of the questions involved led to certain definite conclusions, and these he proceeded to put into practical form by founding schools for the purpose of giving young men instruction in certain trades, and to enable young men already in their trades to improve themselves.

Here courses of instruction are given at very moderate charges in bricklaying, plastering, plumbing, carpentry, house, sign, and fresco painting, stone cutting, blacksmithing, tailoring, and printing. There are both day and evening classes. The thoroughness of the instruction given in each of these trades, it is claimed, leaves nothing to be desired For example, in the bricklaying class the manual instruction will be in building 8, 12, and 16-inch walls; in turning corners and building walls intersecting at different angles; in building piers, arches, flues, fireplaces; in setting sills and lintels; in corbelling, etc.

The scientific instruction is upon the strength of walls, construction of flues, thrust of arches, mixing and properties of mortar, cement, etc. The scientific instruction is given by means of lectures illustrated by experiments, and by carefully prepared manuals.

In the bricklaying classes the young men are taught first how to handle the trowel and how to spread mortar. After this they are practised on 8 and 12-inch walls. When these can be carried up plumb and the courses laid level, the class is put upon walls returned at right angles, piers, arches, fireplaces, and flues. Great care is exercised that each brick is properly laid, and that the joints are neatly pointed. No attempt is made to work fast until towards the close of the course, when an hour is given, at stated intervals, to ascertain how many brick each member of the class can lay in that time in a workmanlike

manner on a straight wall. The brick work is carried up as high as the young men can conveniently work; it is then torn down, and the bricks cleaned to be used again. Before an exercise is commenced, the instructors show how it should be done. The young men are then required to practice under the constant supervision of the instructors until they can do the work well.

The course of instruction in this department extends through nearly six months for the evening classes. The tuition costs $18 for the course. The evening class is limited to 100 young men.

The prospectus of the school makes some interesting statements in regard to the work of the young men. Members of the class of 1883–'84, after finishing their course of instruction, were employed by the proprietor of the New York Trade Schools to build three stores on One-hundred and twenty-fifth street, near Fifth avenue. Many members of the classes of 1884–'85 and of 1885–'86 were employed by the proprietor of the schools to build the large apartment house on the corner of Ninety-third street and Ninth avenue. The members of the class of 1885–'86 also built four houses on Sixty-eighth street, between First and Second avenues. The additions to the New York Trade Schools and five houses on Sixty-eighth street were built by members of the class of 1887–'88. Much work has also been done by members of later classes, both on additions to the trade schools and on other buildings. A calculation is made of the number of brick laid each fortnight, and the young men's wages are graded accordingly. Nearly all the brick of these buildings, except the face brick, were laid by young men who could not handle a trowel when they joined the schools, six months before being employed. Much of the face brick work on the buildings erected the last three seasons was done by former graduates of the schools. These buildings have attracted great attention from mechanics and those interested in training the young men of this country in the mechanic arts. It would be difficult to find more thorough or better work. The lines are true, each joint is straight and neatly struck.

The Philadelphia Builders' Exchange sent a committee last year to inspect these buildings and the work on exhibition at the New York Trade Schools. So favorable a report was made that it was decided to establish trade schools in Philadelphia.

Equal facilities are afforded for learning the other trades taught in this school, and equal thoroughness characterizes the instruction given.

A circumstance of peculiar significance in connection with the tailoring department of the Auchmuty school deserves to be specially mentioned, namely, that the tailoring class is managed by the Merchant Tailors' Society of New York.

The object of the Merchant Tailors' Society in establishing a school of tailoring is to teach the trade thoroughly in all its parts. The school is under the supervision of first class teachers, who are practical

tailors and understand every detail of the trade. Instruction is given throughout the year from 8.30 a. m. to 4.30 p. m., with one hour intermission at noon, except Saturday.

The cost of tuition is $100, payable in advance, for the entire course of two years, or less, if the pupil is found proficient by the examining committee.

The instruction is graded as follows:

First grade.—Plain seams, back and side stitching; felling, stoating, padding collar and lapels; single and double stitched edges; binding and flat braided edges.

Second grade.—Piping and cording of all kinds; tacking pockets of all kinds, raw edges and pockets of all kinds.

Third grade.—Buttonholes of all kinds and sewing on buttons; sleeve cuffs of all kinds; fancy sewing of all kinds; making and finishing all kinds of fronts, lapels, and collars.

Fourth grade.—The pupil to be placed with finishing tailor on coats, pantaloons, and waistcoats.

When a pupil in the tailoring class has finished the course and passed a satisfactory examination, he receives a certificate of proficiency—not from the school, but from the Merchant Tailors' Society, a source which gives it peculiar value.

To accommodate the students of the New York Trade Schools, Col. Auchmuty has erected the building No. 300 East Sixty-seventh street, where comfortable, well furnished rooms are rented at $2 per week for single rooms and $3 per week for double rooms with two beds. This includes lights and attendance. The building is within a few minutes' walk of the schools, and is in charge of a respectable family. Meals can be had in neighboring houses and restaurants at from $3 to $3.50 per week.

The institution is not pecuniarily profitable to its proprietor, nor is it self supporting. The receipts of the New York Trade Schools last season from pupils and the sale of old material were $12,343.55. The expenses, exclusive of interest on cost of land and buildings, taxes, and insurance, were $21,868.09.

The attendance in successive years has been as follows: First season, 30; second season, 98; third season, 207; fourth season, 198; fifth season, 304; sixth season, 337; seventh season, 469; eighth season, 369; ninth season, 520; tenth season, 589; eleventh season, 541.

The New York Trade School Journal is a publication devoted to the interests of the proprietor and apprentices of the New York Trade Schools. The first number of the Journal (for December 1892), whose mechanical make-up represents the skill of the printing class of 1893, is a creditable piece of typographical art.

On its first page, under the heading, How the Graduates Succeed, are given extracts from the record book of the Auchmuty schools, containing reports from 48 recent graduates as to their occupations,

wages, etc. From these letters it appears that the graduates generally receive journeymen's wages at their respective trades within a few months after leaving the schools.

SCHOOL OF THE PHILADELPHIA BUILDERS' EXCHANGE.

As an illustration of what may be accomplished by associations and corporate bodies in the way of establishing apprentice schools, we may cite the example of the Philadelphia Master Builders' Exchange. Reference has been made to the visit of a committee of this exchange to the New York Trade Schools. Mr. Charles Gillingham, of the Philadelphia organization, gives the following sketch of the sequel to that visit:

At the first meeting of the board after the visit to New York, which was on the 8th of May, a committee on mechanical trade schools was appointed, composed * * * of three members representing each of the seven trades to be taught in the school. It was deemed inadvisable to take any active steps for the organization of the school until after the completion of the new building, and as that was not accomplished until October 1889 * * * the work was quietly proceeded with until about one year ago. Then, however, the committee took off their coats and went to work in earnest. On the 18th of March, 1890, they made an official visit to the New York Mechanical Trade School and to the Pratt Institute of Brooklyn, thereby obtaining much valuable information, which enabled them to proceed with their work.

A superintendent was selected, the basement of the exchange was fitted up at a cost of $1,629.58, and tools were purchased to the amount of $1,484.25. The fact that the school was to be opened under the management of the Builders' Exchange of Philadelphia was widely made known through the advertising columns of the daily papers, and applications for scholarships were received to the encouraging extent of 295, the applicants signifying their preference as to the branch of trade in which they desired tuition. As the options ran largely to a few of the trades contemplated, namely, plumbing, bricklaying, and carpentry, it was impossible to accommodate more than 129 pupils.

The next work of the committee was to select nine instructors in the various trades, and the school was opened on the evening of September 2, 1890. The 129 pupils, each of whom pays $18 per term of nine months, were apportioned among the several branches of trade as follows: Plumbing, 61; bricklaying, 31; carpentry, 21; blacksmithing, 7; stone cutting, 3; painting, 3; and plastering, 3.

Col. Auchmuty, whose beneficence is not confined within the limits of his own city, has subscribed towards the expenses of the Philadelphia school the sum of $3,000 per annum for three years. The exchange has accepted the gift, but the school promises soon to become self supporting.

The first year's course of instruction in the Philadelphia trade schools having been completed in June 1891, the occasion was observed with fitting graduation ceremonies. The following extracts from the editorial columns of the city newspapers are of interest, as showing what has been

accomplished within the year, and as indicating the attitude of the press in relation to the movement:

The graduates numbered 62 out of classes with pupils numbering 129, the great difference being accounted for in the fact that many of the young men failed to apply for examination. These were divided among the building trades as follows: Plastering, 3; painting, 2; stone cutting, 3; blacksmithing, 4; carpentry, 14; plumbing, 27; bricklaying, 9. Among the remarks made on the occasion of the graduation exercises were the following significant ones by Col. A. K. McClure: "The great want of this age is American mechanics. We are losing each year. Our mechanics, instead of becoming better, are becoming worse. Instead of artists they have been degenerating in attainments of skill and in their mechanical profession. The great mistake is that they do not respect their own calling, and therefore others do not respect them. Every mechanic should be an artist and master of his trade. He should start out with the resolve to leave nothing unlearned in his particular calling. If they did that they could make their own terms, as they would be worth much more than they are today."

Other speakers praised the Master Builders' Exchange for inaugurating the school, which it was predicted would become a great auxiliary to the public school system.

After commenting on the exercises, the Philadelphia Times said:

The special need of the country today is educated mechanics; that is, a class of skilled industry that is more than mechanical in its aims and attainments, a class that is artistic in everything pertaining to its calling. We have plenty of men in all trades who imitate the mechanical routine they have learned, but the thorough mastery of our mechanical trades is well nigh a lost art in the United States, and the result is that foreigners are now very largely filling the more responsible and lucrative mechanical positions in America.

One of the most unfortunate and unwise theories of our trade unions is that which hinders the free and thorough apprenticeship system of olden times. The only practical result is a steady lowering of the standard of mechanical skill and fidelity and the intrusion of countless competitors from foreign lands and from the imperfect teachings of rural industries. Our printers are crowded with rural type-setters, many of whom never had an opportunity to learn the art of printing, and what is true of the printers, admittedly one of the most intelligent class of mechanics, is equally true of nearly every mechanical pursuit in the land. In machinery American mechanism leads the world, but in most other mechanical callings the complete, artistic mechanic comes from foreign countries, where education and thorough apprenticeship yet rule in mechanism.

INSTITUTE FOR COLORED YOUTH.

The Institute for Colored Youth in Philadelphia was chartered by the state of Pennsylvania in 1842, on the foundation of a bequest by Mr. Richard Humphreys, whose will provided for the establishment of a school "having for its object the benevolent design of instructing the descendants of the African race in school learning, in the various branches of the mechanic arts and trades, and in agriculture, in order to prepare, fit, and qualify them to act as teachers."

An industrial department was finally opened in connection with the school, and in the year 1889 instruction was commenced in the trades of carpentry, bricklaying, shoemaking, printing, dressmaking, millinery, etc.

At the close of the year 1891 there were 108 males and 151 females enrolled in this department. Concerning the usefulness of the instruction in this school the report says:

It is sometimes asked whether the industrial training is of any real practical value. A few particulars of the work done by our pupils will, we think, answer the query satisfactorily.

The statistics show that up to twelfth month last the shoemaking class, which has averaged about 21 members, and works about five hours a week, had made on actual orders received 44 pairs of shoes and had done 187 jobs of repairing. * * *

The bricklaying class has made a most excellent showing. It also numbers about 20 members. One man, who was making $7 a week at opening oysters before he learned this trade in our school, can now easily average $3.25 a day at jobbing, and at one time had in his employ as many as five men, three of whom were also our scholars. His work has included cementing several cellars, building chimneys, setting ranges, repairing, etc. Another man who had been working as a laborer now averages as jobber $3.50 a day. Still another of our scholars, among his other work, built a church edifice at Eighth and Sycamore streets, Camden. This building is 40 by 60 feet and 20 feet high to the square, with a 20-foot peaked gable at each end. It contains upwards of 75,000 bricks. Six young men, five of them scholars of the industrial school, assisted in the work.

The printers also have made satisfactory progress. A monthly report is made to the board of managers of the affairs of the industrial department, which is now regularly printed in the school. Last year's annual report was also the work of this class, and it is expected that the present report will also be printed by them. In addition to this work the class has completed a large number of orders for bill heads, advertisements, business cards, and other similar work.

These three branches are mentioned as giving the best illustrations of the practical results of the industrial training, but an equally encouraging showing can be made by the other classes.

This school is under the care of members of the Society of Friends. There are nine teachers in all connected with the institute, and the course of study covers four years. This includes the high school and normal courses.

WILLIAMSON FREE SCHOOL OF MECHANICAL TRADES.

One of the most liberally planned and endowed of institutions of its class is the Williamson Free School of Mechanical Trades, founded by the late Isaiah V. Williamson, of Philadelphia, "for the purpose of giving poor and deserving boys a good English education, for training them in habits of morality, economy, and industry, and for teaching them mechanical trades." The school is different in some respects from any trade school previously established. It is designed to take the place, so far as a school can, of the old apprenticeship system.

The school has an equipment ample for its purposes. There are three shop buildings well fitted for the trades taught, those for the wood working and machine trades being well equipped with power tools. The plant, including land, buildings, and equipment, to the present time has cost $363,394.60, besides which the school has an endowment and other funds of the par value of $1,575,812.05, the market value being somewhat greater. The school is located at Williamson School, Delaware county, Pennsylvania, about 16 miles from Philadelphia.

Classes are admitted on April 1 in each year. Boys to be admitted must not be under 16 or over 18 years of age; they must be of good health and of good moral character, and they must be able to read ordinary text fluently, write a plain hand, and work in arithmetic as far as fractions. Some elementary knowledge of geography and United States history is desirable, though not absolutely essential. Other things being equal, preference will be given to boys in the following order: Those born in Philadelphia; those born in Bucks county, Pennsylvania; those born in Montgomery and Delaware counties, Pennsylvania; those born elsewhere in Pennsylvania; those born in New Jersey; those born elsewhere in the United States.

All boys admitted are bound as indentured apprentices to the trustees for three years. The indenture may, however, be cancelled by the trustees for the pupil's incompetency or bad conduct, or if, in their opinion, the pupil has so advanced in his studies as to make it more advantageous for him to pursue his work elsewhere.

Each boy on entering the school is given a preparatory course of six months in wood working and mechanical drawing in connection with studies in the school room. At the end of that time he is placed at one of the following three trades (the selection of which is made by the trustees, due regard being given to the inclination and adaptability of the boys to the trade to which they are assigned): Wood working in its various branches, such as carpentering, patternmaking, cabinetmaking, etc.; building, including bricklaying, tile, range, and boiler setting, etc., plastering, and stone masonry; machine trade in all its usual details, including practical training in steam and electrical engineering, steam fitting, etc. Each boy takes but one of the trades named, and his instruction in mechanical drawing, which continues during his entire course, tends in the general direction of his trade.

The work of shop and school room takes up 8 hours daily on 5 days of the week, each boy spending 4 hours in the shop and 4 in the class room. The academic work includes reading, writing, arithmetic, algebra, geometry, physical and political geography, history, elocution, physical science, physiology and hygiene, civil government, chemistry, and vocal music.

The benefits of the school are entirely free, no charge being made for boarding, clothing, or instruction. The boys are divided into families of

24, each having its matron and its own distinct home or cottage, cared for by its occupants. The homes contain no kitchens, dining rooms, or laundries, these being located in other buildings.

The number of applications for admission has greatly exceeded the capacity of the school. The school was opened October 20, 1891, and the first class will be graduated in 1894. With the new class to be admitted on April 1 next the pupils will number 168, divided about equally among the three departments. The faculty of the school now consists of a president, a superintendent, and nine instructors, four being for the academic and five for the mechanical work. The results are reported by the president of the school as being "preëminently satisfactory."

PRATT INSTITUTE.

Rarely, if ever, has a great educational institution been more happy in conception, more wisely planned, or more successful in the results achieved within a brief time than the Pratt Institute of Brooklyn. The institute as organized is the result of many years of study of schools in this country and abroad on the part of its founder, Mr. Charles Pratt of Brooklyn. There was no single institution in existence doing just the kinds of work that Mr. Pratt wished to take up. Cooper Union, in New York city, was doing nothing in the way of industrial work, unless we include under that name the classes in stenography and typewriting and for art instruction. The manual training high schools, then just beginning to multiply, and the New York Trade Schools were both in a measure doing for boys work within the range of his purposes. Schools of the character of the Regent street Polytechnic and the People's Palace in London were just beginning to develop on the lines which they have since so successfully followed out. But in schools of this last class there was nothing just like the manual training and trade schools of our own country. Nor was there anywhere a school offering courses of instruction of such variety and thoroughness as those now offered in the department of domestic art and science of Pratt Institute. Mr. Pratt could not then copy the organization and methods of any one school, but from a study of many models had to create a new and more comprehensive type of school.

It will be found that Mr. Pratt's school comprehends something of the methods of all of these schools, and much more. He has adopted the manual training school, admitting girls as well as boys, however; he has established trade schools on the same general lines as Col. Auchmuty's, adding in the same department scientific and technical instruction, with particular regard to industrial uses; he has added trade schools in some special lines for girls and courses for very comprehensive instruction in domestic science. Besides these, the more important departments, should be mentioned the other departments of music, of commerce, of agriculture, and the classes in library methods,

as well as the technical museum, a collection for illustrating the achievements in science and art with special reference to the work in the classes.

The purpose of the founder in giving such a prominent place to the department of domestic art and science in his educational curriculum is disclosed by the following incident, which he relates to illustrate and enforce his view of the subject:

Returning from France a few weeks since, I met on the steamer some ladies who had gone to Paris for no other purpose than to buy trousseaux for some of their friends, because they could not obtain as fine a quality of needlework in this country. We wish to develop the skill and cultivate the taste of Americans, so that they may be able to do as good work here as can be obtained in Paris.

Again, referring to household economy and domestic science, he says:

One important design of this department is to render it practicable for persons of very limited income to secure and enjoy more comfort in their homes. The man who earns $10 per week will have a more attractive and happy home with a wife trained in household economy than the man who receives twice as much whose wife has had no training in domestic economy and thrift.

The high school department has been already described with other schools of manual training and does not call for any extended notice here.

The department of domestic art and science, if judged by the attendance, is the most important in the institute. It certainly deserves special notice, including, as it does, courses of instruction unique in the combination of constant practical work with the most thorough study of artistic and scientific principles in their relation, not only to good housekeeping, but to home making, to the preparation of clothing, of economical and wholesome food, and to such knowledge of sanitary and hygienic laws as will tend to secure comfortable and healthy homes at the least expense.

The department includes the following courses of instruction: Normal domestic science course, courses in household science, hygiene and home nursing, cooking, laundry work, plain sewing, dressmaking, millinery, and physical culture. In all branches of instruction in this department there are morning, afternoon, and evening classes. In the evening classes the plan of the day work is followed as far as the limited time permits.

The normal domestic science course is a two years' course of five days a week, primarily designed for those intending to teach. Instruction is by means of lectures and recitations, with a good deal of laboratory work. There is practical work, including sewing, laundry work, cooking, and visits to manufactories. The study and practice of normal methods also receive due attention, while a series of lectures by special investigators is given supplementary to the course.

The course in outline is as follows:

First year.—German, physics (energy and heat), chemistry (general and qualitative), biology (bacteriology and physiology), drawing.

Second year.—Chemistry (including chemistry of cooking), chemistry of foods, and calculation of dietaries, household science, hygiene and house nursing, public hygiene.

The division of household science embraces three courses of study, continuing through a year. The instruction by lectures is illustrated and supplemented by visits to private houses and other buildings. The following is a brief outline of the three courses:

House sanitation —Situation of the house, surroundings, and cellar; removal of wastes, plumbing and care of fixtures; substitutes for water carriage, water supply; ventilation, heating, lighting, sanitary furnishing, and general care of the house.

Household economy.—The arrangement of work and furnishings, the care in detail of every portion of the house, house cleaning, household accounts, mistress and maid, household amenities.

Household art.—Architecture, interior decoration, furnishing.

The full course of instruction in hygiene and home nursing consists of three courses of twelve lectures each. The aim is to teach women how to care for cases of sudden illness or accident, and to perform intelligently the duties of a nurse where trained service can not be obtained. In these courses the work of bandaging, artificial respiration, application of splints, lifting helpless patients, and preparing and applying poultices is done by the pupil under the personal direction of the instructor until a reasonable degree of proficiency is attained. To a large extent the instruction is by practical demonstration upon the living model. The subjects of the courses are:

First course.—Heart, and circulation of the blood; general direction of the main arteries; various bleedings and ways of arresting them; immediate treatment of those suffering collapse from injury or fainting, and of those apparently drowned, or otherwise suffocated; immediate treatment of burns, scalds, wounds, and bruises; observing and recording pulse, respiration, and temperature; furnishing, warming, and ventilating the sick room; bathing, dressing, and administering food and medicines to patients; practical bandaging, bed making, lifting and propping helpless patients.

Second course.—Prevention and care of bed sores; treatment of fevers, bathing, sponging, diet, use of disinfectants; nursing special diseases, care of children, immediate treatment of fractures, sprains, unconsciousness, epilepsy, hysteria, poisonous bites, sunstroke, and frost bite; poisons and their antidotes; practical preparation and application of poultices, blisters, and stupes; packs and vapor baths; carrying the sick and injured.

Third course.—Hygiene of infancy and childhood—growth, food and artificial feeding, teething, clothing, exercise, etc.; outlines of physiology and hygiene for adults; care of eyes, ears, skin, digestion, and lungs.

The course in public hygiene consists of twelve lectures on the fol-

lowing topics: The care of streets, sewers, water supply, etc.; precautions against the spread of contagious diseases; quarantine disinfection; the laws, and the reasons for the same, concerning milk, butter, meat, etc.; school hygiene.

In the classes of the cookery section the physiological relations between food and the body are carefully studied, and with these in view the pupil learns how best to choose, to combine, and to prepare foods to meet the demands of healthful living. There are various classes adapted to the times and needs of the different pupils. The complete scheme of instruction is divided into three courses of three months each. Each course consists of weekly lessons of two hours' duration. The subjects covered by the courses are as follows:

Courses A and B.—Making and care of fire, dishwashing and care of kitchen, boiling meats, vegetables, and cereals, soups, stewing and braising, warmed-over dishes, simple invalid cookery, broiling, frying and sautéing.

Course C.—Clear soups and bisques, soufflés and croquettes, salads, French and mayonnaise dressing, entrées and sauces, roast game, fancy desserts and cakes, frozen creams, a breakfast, a luncheon, a spring dinner, a winter dinner.

There is also a course specially designed for physicians, nurses, and others desiring to learn to cook for the sick. Besides a series of lectures on dietetics, it includes the preparation of meat extracts, broths, gruels, soups, beverages, and dishes for convalescents.

Special courses are also offered. A special course of three lessons a week completes the regular work in three months. Another course in fancy cooking consists of twelve lessons of three hours each in advanced work. Still another series of lessons teaches the use of the chafing-dish. All of these courses are on the same comprehensive plan and are followed out with the same thoroughness.

The course of instruction in laundry work covers three months, and includes the following lessons: Some historical notes regarding laundry work, location of the laundry, appointments, care of appointments; classification of articles to be laundered—table linen, bed linen, body linen, flannels; theory—talk upon water, washing soda, soaps, bleaching powders, and bluings, with tests; methods of removing stains; practice work—scalding, rinsing, and bluing bed linen and towels; theory—sprinkling, stretching, folding, and ironing; history and preparation of starch; practice work—starch making; table linen, body linen, and handkerchiefs; shirts, collars, and cuffs; cold and boiled starch; silk, merino, and flannel underwear; prints and hosiery; clear starching—infants' dresses, fancy handkerchiefs; laces and embroidery; crewel embroidery; colored silk embroidery.

The complete course in sewing includes three graded courses of three months each with two lessons a week. In connection with each course talks are given upon the various materials used, with special reference

to judicious purchasing. Each pupil is required to record in a notebook the instruction received at each lesson. At the end of each course a written examination is given.

First course.—Method of threading needle, making knot, and using thimble; talks on the manufacture of the needle and thimble; basting and overhanding; turning hem by measure, hemming and running; talks on weaving; stitching and overcasting; backstitching and felling; gathering, stroking gathers, and putting on bands; making buttonholes and eyelets, sewing on buttons; putting in gussets; talks on the growth and manufacture of cotton; herring-bone stitch on flannel; patching; hemstitching, tucking, and whipping ruffle; chain-stitching, feather-stitching, and mitreing corners; French hem on damask; darning on scrim, cashmere, and stockinet; slip-stitching and blindstitching; mending and darning.

Second course.—Choice of materials; taking measures; machine-stitching; cutting white skirt by measure; making skirt with or without ruffle; cutting underwaist from pattern, basting, stitching, and trimming; cutting and making a cambric dressing sack from pattern.

Third course.—Fine hand sewing; advanced machine work; draughting undergarments; making cambric dress without lining; talks on the growth and manufacture of linen and on fine materials; making baby linen.

The complete course of instruction in dressmaking comprises four courses of three months each. There are three lessons a week, two of two hours each devoted to practical work, and one of one hour to free-hand drawing and design. Applicants must be at least 18 years of age and must have successfully completed the first and second terms of the sewing course, or show an equivalent amount of training. Throughout the courses the work cut and planned in the class must be finished at home. The courses in outline are given below:

First course.—Talk on color and textiles applied to dress; instruction in the choice of materials; cutting foundation skirt from measure; finishing skirt for trimming and draping; talk on form, line, and proportion in relation to draping and trimming; planning skirt; draping skirt; cutting waist and sleeves from pattern; basting, fitting; trimming, finishing; drawing, including pencil practice, study of the appearance of cylindrical objects, study of drapery, and drawing of skirt, bows, etc. In this course each pupil is required to complete one dress for herself and to do as much practice work at home as is possible.

Second course.—Talk on woollen textiles and their manufacture; choice of materials and colors; practice in taking measures; talk on form, including artistic and hygienic principles of dress; instruction in draughting close fitting waist; cutting and fitting waist linings; cutting and fitting plain cloth basque; cutting and matching striped or plaid basque; draughting waist with extra seam for large figures;

trimming and finishing waist; drawing, including drawing of waists and gowns, notes on form and color, and practice in the use of color. In this course two basques, one of plain and one of striped or plaid material, are completed. Constant practice in draughting at home is required.

Third course.—Instruction in choice of materials for house and street wear, considering color and texture; talk on the growth and manufacture of silk; taking measures and draughting princess dress; talk upon the contour and poise of the body as essential in artistic dress; planning princess dress; cutting and making princess dress; practice in draping, illustrating the principles of variety, unity, and repose; cutting and making house or evening dress from original design by pupil; draughting; drawing, including problems in design, sketches in water color of gowns, etc., and outline and proportion of the human form.

Fourth course.—Talk on the manufacture of cloths; draughting jackets of various styles; cutting, basting, fitting, and pressing; making various styles of pockets and collars; lining and finishing jackets; cutting and fitting child's dress and coat.

The work in the millinery classes is divided into three graded courses, each covering a term of three months, with three lessons a week, two in practical work of two hours each, and one of one hour in free-hand drawing and design. In connection with each course talks are given on the suitability of materials, combination of colors, and character of lines and form as essential to artistic millinery. Here, as in the work outlined above, the courses are planned with careful attention to thoroughly educating the taste and training the hand and eye by constant practice of the best methods.

The department of science and technology affords instruction in various scientific and technical subjects, as well as a thoroughly practical training for the principal mechanical trades. The scientific and technical subjects studied are algebra, geometry, physics, chemistry (two years' course), electrical construction, steam and the steam engine, strength of materials, and machine design. The shops and the laboratories of the departments are supplied with such appliances as will best promote the efficiency of the instruction.

The work in the trade school includes both day and evening classes. In the day classes the instruction is similar in outline to that of the evening classes, but greatly extended in amount and variety, and includes a much greater amount of practical work. The day classes afford sufficient time by continuous practice to prepare for practical work at the trades. In the evening classes the aim is principally to broaden and extend the training of those already engaged at the trades.

Under the methods pursued, carefully arranged courses of work are provided in which the reason of each step is clearly explained. Fre-

quent talks on methods and materials are given throughout the course. The school does not aim to turn out journeymen mechanics, but to afford a training that further practice in active work will perfect. The trades taught are carpentry, machine work, plumbing, and house, sign, and fresco painting. Outlines of two of them will be sufficient to illustrate the methods and to indicate the thoroughness of the training. In each case it is the evening course that is described.

Carpentry.—Use of tools; course in joint work; methods of framing; making model of frame house; setting and bridging of partitions; laying of floors; making and placing doors and window-frames; sheathing, clapboarding, shingling, cornicing; inside trimming; making and hanging of doors, sashes, and shutters; wainscoting, base-boards, stair building, etc.; practice in the use of working drawings, and laying out work from plans.

Plumbing.—Use of tools; preparing wiping-cloths; making soil; tinning soldering-iron, brass, iron, lead, and tin; making solder; soldering seams; making cup joint, over-cast joint, straight-wiped joint, flange joint, and branch joint; working sheet lead into bends, traps, service boxes, and safes; lining tanks; caulking iron pipe joints; bending with sand and kinking irons; also lectures on the materials used in the trade, the proper arrangement of drain, soil, and waste pipes, trapping and ventilating the same, supply pipes, boilers, tanks, fixtures, and pumps. Charts and diagrams are freely used, and study is made of examples of defective plumbing. Special attention is given to the plumbing rules of the city of Brooklyn.

The department of industrial and fine arts aims to provide thorough and systematic art instruction. Courses for both day and evening classes include training in drawing, clay modelling, design, architectural drawing, mechanical drawing, wood carving, and art needlework. The work in all the courses is of quite a comprehensive character, in no case covering less than two years, and in the regular art course requiring four years.

The other departments do not call for extended description. The very brief notice of them already given has sufficiently indicated the character of the instruction.

On the whole the Pratt Institute appears to be a most liberally planned and judiciously managed institution, whose founder is ever seeking, with wise and discriminating judgment, to increase its efficiency and expand the sphere of its usefulness.

It is somewhere observed by Mr. Ruskin that the wisest man is he who has been oftenest aided, who is taught by every one he meets, and enriched by everything that falls in his way. With the wisdom which comes of wide experience, Mr. Pratt remarks on the subject of tuition:

There is no one subject in connection with this work upon which I have such peculiar feelings as when a poor man comes to pay his hard earned wages for the education of his child. Instinctively my feeling is to

say, "Don't take the money"; but in my cooler and calmer thoughts the judgment formed after long and patient study of human nature tells me that it is wiser and better for every one to pay a part at least of the cost of this education.

The institute occupies four large buildings. The main building on Ryerson street is 100 by 86 feet and six stories high. The science and technology building, with the extension, is 144 by 95 feet, and the one-story trade school building is 103 by 95 feet. The high school building is 50 by 80 feet and three stories high. Plans are in progress for the construction of a new building, during the present year, for the accommodation of the library, the museum, the art department, and a large auditorium.

The catalogue of the institute for 1892–'93 shows the registration in the various departments for the fifth year of the school, 1891–'92, to have been as follows:

Department.	Day.	Evening.	Total.
High school	144	.....	144
Department of industrial and fine arts	559	333	892
Department of domestic art and science	1,388	552	1,940
Department of science and technology	80	232	312
Department of music	89	244	333
Department of commerce	133	293	426
Library classes	43	.....	43
	2,436	1,654	4,090
In more than one department	.....	.....	149
Total individuals enrolled	.....	.....	3,941

The teaching force of the school consists of the heads of the various departments, with a corps of about 90 instructors and assistants.

The institute has been most liberally provided for by Mr. Pratt. A statement made by the president in October 1891 shows the amount of its property:

Endowment fund	$2,000,000.00
Real estate, building and equipment fund, to be used as required	835,000.00
Cost of present institute buildings, equipment, and grounds	523,337.61
Cost of Astral, Inwood, and Studio buildings	332,437.07
Total	3,690,774.68

DREXEL INSTITUTE.

The Drexel Institute of Art, Science, and Industry, at Philadelphia, is a new school of complex character. The school was opened in September 1892. As now organized its work comprehends six departments, viz., department of mechanic arts; business department, including a commercial course and a course in stenography and typewriting; technical department, including cookery courses and trade courses in dressmaking and millinery; normal department, including courses for training of teachers in drawing, science, physical culture,

manual training, cookery, dressmaking and millinery, and the course in library work; scientific department for advanced scientific training in physics and chemistry, and applications; and art department, including a regular art course, a normal art course, a course in mechanical and architectural drawing, and courses in applied design, decorative painting, wood carving, and stained-glass work. Several additional courses are to be added, among the more important of which will be courses in electrical engineering, mechanical engineering, and machine construction.

The building with its equipment has thus far cost about $1,000,000. The endowment is $1,000,000, which is dedicated to the maintenance of the instruction. The institute possesses a valuable library of about 10,000 volumes, and a museum devoted to art industrial productions, such as textiles, ceramics, wood carvings, metal work, ivories, embroideries, etc. The whole is the gift of Mr. Drexel of Philadelphia.

The teaching force now numbers over forty, with President James MacAlister at the head. The work of the next year will require an increase in the number of instructors.

The instruction in the department of mechanic arts is of the advanced manual training character. It aims to give a general rather than a special training. The work provides a thorough course in mathematics, science, drawing, and shop work in connection with the essential English branches of a secondary education. The time of the student is about equally divided between the class room and laboratory studies, and the shop work. The course of instruction covers three years of two terms each. The tuition is $20 per term.

The course of instruction is as follows:

First year.—Arithmetic, algebra, plane geometry; distribution and economic uses of minerals and plants, chemistry, physics (laboratory work and lectures); English language; free-hand and mechanical drawing, clay modelling; and shop work, which includes carpentry, joinery, wood turning, bench work (chipping and filing) in iron, care and use of tools.

Second year.—Solid geometry, plane trigonometry, business forms and accounts; physics, physiology and hygiene; English language and literature, civil government; mechanical drawing, historic ornament, clay modelling; and shop work, which includes patternmaking, moulding, casting, forging, welding, tempering, soldering, and brazing.

Third year.—Spherical trigonometry, surveying, theoretical mechanics; electrical physics and applications of electricity, theory and practice of the steam engine; English language and literature, practical economics; mechanical drawing, architectural drawing, principles of design; and shop work, which includes constructive wood work, ornamental iron work, applied mechanics, machine work, and practical training in connection with the extensive mechanical and electrical plants in the institute.

The technical department includes courses in cookery and in dressmaking and millinery work. The following courses in cookery are given:

First course.—The fundamental principles of cookery, and practice in the preparation of simple dishes and courses. In connection with the practical training in the making of dishes, elementary instruction is given in the composition and dietetic value of foods.

Second course.—This course includes instruction and practice of an advanced character in the preparation of more complicated dishes and menus than are included in the first course, cost of materials for and preparation of a dinner.

Course in invalid cookery.—This course is intended for the training of professional nurses and persons desirous of acquiring a practical knowledge of cookery suitable for the sick room. It embraces general principles, followed by special instruction and training in invalid cookery.

Normal course for training teachers of cookery.—The object of this course is to train special teachers of cookery, for whose services there is a constantly increasing demand. The instruction is thorough and occupies one year. It embraces the following subjects: All the preceding courses in cookery; chemistry and its applications to cookery and other departments of domestic science; human physiology, personal hygiene, and public hygiene and sanitation. Lectures on the general principles of methods of teaching and on the history of education in its relations to this department of school work.

The tuition in the cookery courses is, for the first course, $10; second course, $15; invalid cookery, $10; normal course, $30.

The instruction in dressmaking is arranged in three courses, each of five months' duration. The first course is devoted to the fundamental principles of dressmaking, the choice of different materials, draughting the skirt from measurements, cutting, making, hanging, and draping the skirt, cutting and fitting the waist from patterns, and the general finish of garments. The second course includes draughting the waist from measurements, matching striped, plaid, and figured materials, and advanced work in making princess dresses. A considerable portion of the time is devoted to practical work leading to a knowledge of the designing of dresses. The third course is intended for students who have satisfactorily completed the first and second courses, and consists of draughting and finishing outside garments of different materials and the making of children's garments. Each student is required to design and make a street dress, a dress in gown form, and a coat. During the first course instruction is given in business forms and accounts, during the second course lectures are given on the chemistry of textiles and dyeing, and during the third course on the history of costume. Throughout the courses instruction is given in the kinds and qualities of materials used in dressmaking. The tuitions are, for

the first course, $15; for the second course, $20, including draughting chart; for the third course, $25.

In the millinery division there are two courses, each occupying five months. During the first course are taken up the fundamental principles relating to the making of hats, bonnets, and toques. These are executed in colored cotton flannel, sateen, and cheese cloth, which represent, respectively, velvet, ribbon or silk, and crêpe. The instruction and practice leads at the end of the term to the making of hats, bonnets, and toques of choice materials. In the second course pupils pursue the study of black silk and crape work, frame-making, and practical work in choice materials. In this, as in the dressmaking classes, certificates are granted to such students as satisfactorily finish all the courses prescribed. The fee for each course is $12.

In the normal department of the institute courses are provided for the training of special teachers of drawing, of science, physical culture, manual training, cookery, dressmaking, and millinery. There is also a class for the training of assistants in library work, and a normal course in the department of physical culture designed to supply competent and thoroughly equipped instructors and directors in that branch.

The scientific department embraces a division of physics and a division of chemistry.

The courses in physics include training in laboratory methods, general physics, and a technical course in applied electricity. For admission to the last mentioned course the student must have a good knowledge of elementary algebra and plane geometry and of general physics. The course in electricity occupies two terms, taking up the elements of electricity and magnetism. The student, by lectures and practical work in the laboratories, is familiarized with the applications of electricity to telegraphy and telephony; the methods and apparatus used; the properties of overhead and underground lines; the management of primary and secondary batteries; principles of dynamo-electric machinery; the use of the dynamo for lighting and for the transmission of power; use of the motor in stationary power plants and on railways; wiring and line construction.

In the chemical division the elements of the science are taught, and in the higher courses qualitative analysis and industrial chemistry of a more advanced character may be studied. The main object of this advanced work is to prepare students for actual work as practical chemists and in the arts and manufactures requiring chemical knowledge.

Special lecture courses are provided for students of various technical branches. These courses are as follows: Chemistry of the metals, 10 lectures; chemistry of textiles and dyeing, 12 lectures; chemistry of foods, 12 lectures; chemistry of photography, 10 lectures; chemistry of paints and painting, 10 lectures; chemistry of clays, 5 lectures.

The art department, besides its regular art and normal courses, offers some art courses of special industrial value. The first of these are the special courses in mechanical and architectural drawing designed to fit students for practical work in the draughting room and the architect's office.

The course in applied design is for the training of professional designers, and occupies three years. It provides instruction in the principles of decorative design and in the technical methods of their practical application. The instruction runs nearly parallel with that given in the first three years of the regular art course, with special training in the application of art to the production of original designs for oil-cloth, wall papers, carpets, wood work, metal work, tiles, book covers, etc.

Thorough technical courses are given in decorative painting, wood carving, and stained-glass work. In all these courses a preliminary art training is necessary to the completion of the work.

ARMOUR INSTITUTE.

It is expected that the Armour Institute (to be opened for the reception of pupils during the year 1893 at Chicago) will prove a powerful auxiliary of educational work in the Northwest.

The institute has been organized on the plan of a series of trade and advanced technical schools. It will do for Chicago a work similar to that done by the Pratt Institute in Brooklyn and the Drexel Institute in Philadelphia, but still broader and more diversified.

The carrying out of the full idea, including the new building for the manual training and practical classes, recently completed, will involve an expenditure by Mr. Armour of about $3,000,000, including the large amount of productive property surrounding the institution which Mr. Armour has given for purposes of perpetual endowment.

Armour Institute is organized into departments, each of which is in the charge of a director. The departments already organized are as follows: The department of mechanical engineering; the department of electricity and electrical engineering; the department of mining engineering and metallurgy; the department of domestic arts; the department of library science; the department of art; the department of kindergartens; the department of commerce.

Besides the equipment of the several scientific departments the institute has a gymnasium, a technical museum, and a library. The home of Armour Institute is a fire-proof building of the most modern construction, five stories in height above the basement, and furnished with every convenience that health, comfort, and the requirements of such an enterprise could dictate.

This institution is founded for the purpose of giving to young men and women the opportunity of securing a liberal education. It is hoped that its benefits may reach all classes. Its aim is broadly

philanthropic. Armour Institute is not a free school; but its charges for instruction are in harmony with the spirit which animates alike the founder, the trustees, and the faculty, namely, the desire to help those who wish to help themselves.

The New York Trade Schools, Pratt Institute, Armour Institute, etc., are types of American trade schools where the instruction is of a more practical character than that of the English technical schools. On this point Dr. W. T. Barnard said, writing in 1886:

> I know of but one English school where any consistent efforts are made to apply school instruction in the shops—that of Mather and Platt, Manchester, whose teachers are employed in the shops, and personally direct the theoretical instruction of their pupils to shop work. The absence of this combination of theory and practice, under intelligent direction, constitutes the great weakness, and seriously impairs the usefulness, of such schools. To teach the principles of mathematics, physics, mechanics, machine construction and gearing, the formulæ of chemistry, etc., without fixing those principles in the scholar's mind by illustrative experiments, the actual handling of apparatus, machinery and tools, is an impractical method of instruction which, as aforesaid, has in a large measure destroyed the usefulness of technological as well as of public schools.

WATCHMAKING SCHOOLS.

In the Waltham Horological School at Waltham, Massachusetts, the course of instruction includes watchmaking, repairing, and bench tool making, as well as optics and engraving. The school aims to meet the needs of two classes of students—those who wish to learn watchmaking, and those who, after experience in the shop, wish to perfect themselves in the trade.

The school claims that under the training given "not only is the American watch system taught in all its branches, from taking the rough stock and bringing it to a state of perfection, but all foreign systems, such as the Swiss, English, and in fact every known manufacture of watches, taught so that the student is not only able to repair American watches and understand how to make any part to be duplicated, but he is equally well posted on repairing foreign watches, and understands how to make or repair any part requiring the skill of a thorough watchmaker or repairer."

It is stated that some students, with previous experience, graduate in six months. The average time of graduation is one year. The tuition for the course is $200. The graduates of the school number about five hundred, most of whom are employed in watch factories or in watch repairing shops throughout the country.

A school of watchmaking, known as the Chicago College of Horology, has been in operation for several years at Chicago, Illinois. Up to date seventy-five pupils have been graduated at this institution or have received certificates of attendance for periods varying from one month to a full year.

In 1888 a school for watchmakers was established at La Porte Indiana. In this school students are taught the art of making high grade chronometers and fine lever watches from raw material. Engraving, optician's work, etc., are also taught, and pupils are required to master every detail of the work. Twenty-nine pupils were enrolled in 1891. The school enjoys an excellent reputation among horological experts. Other American schools of watchmaking are the Chicago Watchmakers' Institute, at 26 Van Buren street, Chicago, Illinois; Elgin Horological Institute, Elgin, Illinois; Parson's Horological Institute, La Porte, Indiana; Saint Louis Watchmakers' School, Saint Louis, Missouri; and Woodcock's School for Watchmakers, Winona, Minnesota.

GENERAL SOCIETY OF MECHANICS AND TRADESMEN.

The General Society of Mechanics and Tradesmen of New York city maintains a free school of industrial drawing. The classes are composed of young and middle-aged mechanics, all of whom are daily engaged in occupations that demand a knowledge of drawing, of a special kind, before they are able to make any advance in their several trades. The work of the school, as designed, provides such training as will advance them in the most rapid and practical manner. The instruction is not, properly speaking, class but rather individual instruction, the teacher giving each pupil personal attention and advancing him according to his knowledge and capacity.

The plan of the school comprehends an architectural or builders' course, a mechanical course, a course in free-hand drawing, a course in cabinet work and decorative design, and a course in modelling. There are, beside, courses in stenography and typewriting.

The architectural or builders' course is for the study of architectural work and drawings as prepared by architects. The object of the instruction is to enable the pupil to fully understand and work from such drawings, and to prepare for himself drawings of lesser importance. The pupils are masons, carpenters, stone cutters, ornamental bricklayers, etc., of all degrees of proficiency from the beginner up. The students in the mechanical course are from much the same occupations as in the builders' course. The work embraces the geometrical drawings required by joiners, framers, stair builders, metal workers, patternmakers, etc., with the special applications in each occupation.

In the course in free-hand drawing are found engravers, chasers, die-sinkers, fresco painters, lithographers, etc., training themselves for advancement in their chosen vocations. The course in cabinet and decorative design attracts cabinetmakers, furniture designers, decorators, wood carvers, etc. There is also a course in modelling where good work is done.

Of the good results of the training, not only the testimonials of former

pupils, but the better evidence of their work, furnish the strongest proof.

This society also maintains ten free scholarships in the New York Trade Schools.

NEWARK TECHNICAL SCHOOL.

The Newark Technical School of Newark, New Jersey, according to the director's statement, is not a school for teaching trades; it is not a school of manual training. The classes of men the technical school is designed to reach are abnormally developed, it might be said, in the line of manual training, and it is the mental training which is necessary to round out the complete man. The latter the technical school designs to give.

This institution is, as nearly as possible, a continuation school of Europe transported to the shores of New Jersey. The school was opened February 9, 1885.

The sessions of the school are held five evenings in the week, namely, from Monday to Friday, inclusive, during the hours from 7.20 to 9.30. The course of study requires four years, and is arranged in the following departments:

Department of science.—Physics with applications; general and agricultural chemistry with applications.

Department of mathematics.—Arithmetic, algebra, geometry (plane and solid), trigonometry; elementary mechanics, principles and use of machinery and tools.

Department of drawing.—Free-hand, model, cast, architectural, mechanical.

In 1888 there were 255 pupils in this school. None are admitted until 16 years of age, except to the preparatory department, which any boy may enter, without examination, at 15. Applicants for admission to the regular departments must pass an examination in arithmetic, geography, history, and English composition, or bring certificates of graduation from a grammar school.

The number of students enrolled in all the classes in 1890 was 286. The graduating class of 1891 consisted of 6 members. One is a tool maker, one a surveyor, one a machinist, one a clerk, and two are draughtsmen.

SCHOOL OF MESSRS. HOE & CO.

For thirty years a school has been conducted in New York city by the Messrs. R. Hoe & Co., of printing press fame, for the benefit of the sons of their workmen. According to the statement made in the fourth annual report of the New York bureau of labor statistics, 250 boys are employed in the factory of the Messrs. Hoe. Since they can not all be taught at the same time, they are divided into classes, receiving instruction two evenings a week. The teachers and the school rooms are

provided by the firm; and inasmuch as the boys have already had their day's work before they enter on their school duties, Messrs. Hoe give them their suppers at the closing of the shops at half past 5 o'clock, so that they may not have the need of going home, some of them to a considerable distance, and returning for the school, which opens at half past 6.

The school is free. The course of teaching is thoroughly practical, with a direct bearing on their advancement in the calling to which they have given themselves. The studies are mechanical drawing by rule and compass, arithmetic, algebra, and geometry.

The school has been at work many years, and the results have been satisfactory. It has identified the boy beginners with the firm; they have developed into workmen who understand their duty and do it intelligently. During the school session, which lasts the greater part of the year, with intermission in the summer evenings, the boys are further instructed and entertained by lectures and other means of relieving the monotony of the school routine.

NEED OF TECHNICAL EDUCATION.

The necessity of improving the technical skill of the American workman is urgently demanded both on economic and educational grounds. Dr. W. T. Barnard puts the case with clearness and force when he writes:

Skilled labor must be had from some source, and we can not afford to import it in bulk, if for no other reason than its expensiveness. Our own people have the first claim upon our industrial occupations, but if we are to compete for foreign trade they must be so trained as to make and keep them, in knowledge and skill, at least the equals of foreign workmen.

On this subject, indeed, there is a general consensus of opinion among those most intimately concerned in the educational and industrial interests of our people. In a suggestive essay entitled Economic Aspects of Industrial Training, Richard T. Ely, Ph. D., expresses in a single sentence the conviction which he shares, in common with many of our wisest educators, when he writes:

Industrial training, not for a few, but for all people, for every boy and girl born in the United States, without one exception, is the chief economic demand of our time. * * * Comparatively little is attained by picking out a few here and there and elevating them above the masses by technical schools. We want to extend the benefits of industrial schools to all alike.

The relation of industrial training to commercial pursuits was indicated by the president of Cornell University in an address delivered November 15, 1892, on the subject, Education and Commerce, in the following explicit language:

Commerce has hitherto done its mighty work mainly by rule of thumb, but every human pursuit and profession is now maimed in its efficiency

by the relatively undeveloped condition of pure and applied science. I sometimes hear that we are to win the markets of the world by free trade and retain the home markets by protection. Well, the freedom in which I see greatest potency is the free instruction of the industrial classes, of men and women of all pursuits and professions, in the highest and deepest truths which science can discover.

The nourishment of science is so costly that it can no longer be done without aid from the state. We have not, in all this land, a university that even tolerably represents existing knowledge, to say nothing of its growth. In the interest of the large majority of our people it is both just and politic for the state to offer universal free education of the highest as well as of the lowest order. The old fashioned college, designed for a few favored classes, belongs to the past. The modern democratic and industrial world demands a university as broad as the life and interests of all the people. Such a boon is today the greatest need in our state of New York.

An intelligent observer, Mr. William Mather, the member of the British royal commission, who visited this country in 1883, in his report on the condition of industrial education in the United States, makes a suggestion that is worth recalling in this connection. This friendly critic refers to the act of Congress of 1862, granting lands and land-scrip to each state for the establishment of colleges of agriculture and the mechanic arts; and, while noting the fact that many of the institutions founded on this sagacious scheme of statemanship have become almost exclusively literary, he predicts that "within a short time these institutions will become the great technical schools of the country."

It is clearly within the power of the several states to regulate the courses of study pursued in the institutions alluded to by Mr. Mather. In the act establishing provisions for colleges of agriculture and the mechanic arts, we read, "The leading object shall be * * * to teach such branches of learning as are related to agriculture and the mechanic arts in such manner as the legislatures of the states may respectively prescribe in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions of life."

The states have not yet availed themselves of all the privileges to which they are entitled under this enactment. Mr. Mather, in the report already referred to on industrial education in the United States, remarks with evident surprise: "I have not met with any institutions for technical training having any bearing upon the textile industries."

Sagacious countrymen of our own comment regretfully on the same theme. In a letter to this Department under date of October 28, 1890, Mr. S. N. D. North, secretary of the National Association of Wool Manufacturers, writes:

I have been convinced that one great reason why our manufacturers fail in competition with foreigners in the production of the finer fabrics, those which involve the artistic element in pattern and manipulation, is because neither they nor their employés have the training and education which have permitted the Europeans to achieve such splendid

results. If their attention can once be sharply brought to this fact, they may inaugurate the system of technical training in this country on a basis that will gradually approximate the systems of England and the continent. [He adds] I am convinced that there is no branch of industry which has so much to gain in this respect as the woollen manufacture.

In the British royal commissioners' report on technical instruction occur the following pertinent remarks:

In textile industry it is the design that sells the cloth. The quality of the fabric may be hard to tell, but every customer forms his own estimate of the pattern printed upon it, or woven into it. The wool comber, the spinner, the weaver, may each do his part faultlessly, but if the design is unsatisfactory or inappropriate, or the color or finishing of the piece is ineffective, it will be cast aside by the purchaser as inferior the moment it is displayed on the shop counter against more effective, even though intrinsically less valuable, goods.

To the same effect spoke Mr. Swire Smith of Bradford, England (a large manufacturer and a prominent advocate of technical education), in an interview reported in the Dry Goods Economist, and reprinted in the Irish Textile Journal of June 15, 1890. We copy that portion of his remarks which relates to American manufactures:

In my present extended tour through twenty-four states of the Union, I have taken care to ascertain in the several cities visited the proportion of foreign goods sold in comparison with those of American production.

In nearly every case I have found that the goods possessing the highest value and the most perfect design and workmanship were of foreign manufacture, and the lower grades were well represented by those of American production. In this I have been forcibly reminded of the condition of Great Britain ten years ago, which had, up to that time, devoted her manufacturing energies to the production of goods for the million, so much so that the greater part of the highest grade of goods sold was of foreign manufacture. A very prosperous trade had been enjoyed by England until foreign governments shut out these goods by tariffs in order to encourage their own industries.

In this condition English interests were impoverished, and it was then that great impetus was given to technical education. This was taken in hand so promptly and with such spirit, and manufacturers adapted themselves to the changed condition of affairs so quickly, that today the chief exports of textile goods from England are not in the commoner grade of goods, but in the high class novelties which the United States appreciates so highly. As far as my observations in this city [Philadelphia] have extended, I have found that goods easily manufactured without any special skill are produced in this country, whereas the highest grades of goods are imported. There is no country in the world that can afford to buy such expensive dress as the United States, and the greater quantity of these goods, which are made abroad, are sold here. This state of things ought not to be, and that it does exist is doubtless due to a want of technical training.

In conclusion Mr. Smith says:

This must not be forgotten—that your people, in proportion to their means and ever increasing appreciation of taste and sterling value,

will give a higher price for the fabrics that please them, even though made abroad, rather than a low price for fabrics that are ugly or flimsy, even though made at home. Twenty years ago the textiles from England were mainly common goods, now they are the superior and attractive goods, and this statement applies even more to the imports from France and Germany, who have hitherto paid more attention to attractiveness than the English.

To illustrate the methods employed in the best technical schools abroad, and to indicate the thoroughness of the instruction which they give, let us take, as an example, the weaving school at Crefeld, Germany.

Here the course is divided into two sections—the theoretical and the practical; the first including a thorough study of drawing, the second including instruction on the loom. Drawing and painting are taught from copies and models, and from natural plants and flowers, with adaptations to printing and other branches of the textile industry. Due prominence is given to geometrical drawing, and the drawing of machines, particularly of those parts of the loom which affect the pattern in the woven fabric.

There are also lectures on textile fibres, on the elements of weaving, and on machinery. Fabrics are decomposed and explained, looms are arranged for weaving plain goods, or goods with simple designs, and technical calculations and bookkeeping are carefully taught.

In the second year lectures are given on the principles which govern the ornamentation of woven or printed fabrics, and the art teaching is continued until the student is able to invent and apply original designs. He is then admitted into one of the studios, where, under the guidance of qualified designers, he is encouraged to give play to his own imagination.

At the same time he continues his studies in the decomposition of patterns, and in the composing and calculation of designed materials. He attends lectures on the construction, erection, and action of the looms and other machines used in weaving; he unmounts the power loom, piece by piece, and builds it up again; he works at the forge and learns the use of the machine and hand tools in the workshop; he cuts the cards in accordance with his own design on the paper prepared by his own hands; he fixes the cards in the Jacquard machine, and at length becomes thoroughly practical in weaving the most complex pattern, both in hand and power looms. After two years' instruction of the sort above described, the product is an accomplished weaver.

TEXTILE SCHOOL, PHILADELPHIA.

It must not be supposed that America has no trade schools which can bear comparison with those of foreign countries. The School of Industrial Art in Philadelphia has a textile department, established in 1883, which, in the estimation of good judges, is superior even to the famous

Crefeld school. From the Pennsylvania Report on Industrial Statistics for 1888 we quote what is said of the origin of this department:

Partly from a desire to advance their own interests by educating the workmen and designers employed in their own mills to do the higher classes of work, which are of course always the most profitable, but largely and mainly from motives of pure patriotism and philanthropy, to help raise the standard of American productions and to educate American youths in such a way as to enable them to occupy the positions as designers and superintendents now held almost exclusively by men who have profited by the advantages offered by European schools, the manufacturers of Philadelphia raised among themselves the amount necessary to establish and equip this school.

These men subscribed in 1882 a fund of $30,000 for the enterprise, the year previous to that in which Mr. Mather visited America and found no school for instruction in textile industries. The undertaking prospered, and now, according to this report, it is no longer incumbent upon any one to visit Europe for technical instruction in textile art, as this school is fully prepared to supply technical information on all subjects connected therewith.

The status of this institution is justly a source of local pride and of national satisfaction.

The school furnishes not only the first instance of work of this character being undertaken by an American school; it is doubtful whether certain advantages and merits do not attach to its methods over those of even the best known of the European institutions. In support of this view is the testimony of several persons who have attended this school after having been pupils of some of the best of those in Europe, and who cheerfully accord to the Philadelphia school the first place in regard to the advantages afforded.

These advantages consist mainly in the more adequate facilities which are furnished the pupil to carry all, or nearly all, the work projected by him to completion. This is a phase of the plan of instruction to which comparatively little importance seems to be attached, and for the carrying out of which very slender provision is made in the European schools.

At Crefeld, for example, which is usually regarded as quite the model textile school in Europe, the looms are kept running but with no great variety of product, but with more or less distinct aim of producing goods which shall have a certain commercial value, and the pupils have the opportunity of assisting at their operations as any other juniors or apprentices might do; but, except in rare instances, as when one's design is selected at the end of the term from those produced by a whole class, the practical work at the loom has no relation to the design produced by the student.

In the Philadelphia school, on the other hand, the pupil has continually to carry his individual design to completion, performing or assisting at every process in its progress, from the preliminary sketch to the dyed and finished fabric. Whatever this last represents of taste, of knowledge, or of skill, whatever calculations are involved, the commercial ones as well as those possessing artistic or technical significance, all must be the pupil's own.

* * * * * * *

Since 1887 the school has received assistance from the state to the extent of $10,000 a year, in return for which the school grants free scholarships, one for each county, to be filled by appointment of the governor.

The course of technical study in this school extends over three years. The circular of the school for 1891–'92 contains the names of 151 former students of the school, with their present occupations. This is only a partial list, but it shows that a very large proportion of the graduates become designers, draughtsmen, dyers, architects, or manufacturers.

Were technical trade schools of an equal order of excellence established all over the country, even if there should be only one such school in each state, the result would naturally be to give a powerful stimulus to industrial education, and to lift the trades to the dignity of the professions, the artisan to the plane of the artist. The special function of such a school would depend partly upon the nature of the industry in the region of its establishment, and might be determined wholly by local circumstances. It need not be a weaving school; it might be a dairy school, or a school of forestry or of farriery, according to the special need.

From another volume of the valuable series of educational reports recently issued by the state of Pennsylvania, the Report of the Industrial Education Commission for 1887–'89, we learn that:

There is not in the United Kingdom a technical institution of the grade of the Massachusetts Institute of Technology, not a manual training school, as far as the commission has been able to ascertain, of the grade of the Philadelphia, the Saint Louis, or the Chicago Manual Training School.

And it may not be presumptuous to add that there is probably no school in the world where the manufacture of textile fabrics, in all its branches, is more thoroughly or more practically taught than in the School of Industrial Art at Philadelphia.

INSTITUTE FOR ARTIST-ARTISANS.

In this connection we can not forbear to make an appreciative reference to the work undertaken a few years since in New York city by Mr. John Ward Stimson. In 1888 this gentleman founded a school for artist-artisans at the American Institute. In the Home Journal of January 14, 1891, a communication was published giving a concise account of the origin of this institute and of its beneficent achievements. The writer of the article says:

Americans are recognized among foreign manufacturers as possessing unusual technical skill, but complaint has been made of their lack of originality in design.

This, we may remark parenthetically, is the usual criticism of both native and foreign observers who are best qualified to express an opinion on the subject.

Partly, therefore, as a remedy for this [continues the writer] we may look to the Institute for Artist-Artisans, which has recently attracted the notice of artists and leading manufacturers. * * *

The special teaching begins with a more or less extended course in drawing from the flat, from casts, and from life. Natural forms, flowers, shells, minerals, etc., constantly illustrate nature's own application of the primary laws of form; the student in brief learns how the creative spirit works out its expression step by step, "that form is but the embodiment of law and reason." He learns the true significance of design, and where he handles his own plastic material can give it shape which embodies thought. * * * Mind and hand are trained together, enjoyment waits upon appreciation, and servile imitation gives way to the expression of individuality.

Such, theoretically and ideally, is this school. If achievement lags behind aspiration in this instance it is because of the imperfection which inheres in all human institutions. It is apparent, however, that the institute is winning its way to success. Its second year's work is reported to have been double that of the first. "Instead of four rooms, there are now ten; instead of seven departments, fourteen; instead of three instructors, nine," says the writer in the Home Journal.

William Hamilton Gibson, the writer and artist, is the latest addition to the corps of instructors, assuming charge of the department of illustration and design. The other instructors and lecturers include John Ward Stimson, of the Paris Beaux Arts; Conrad Diehl, of the Munich Art School; Frederick Kaiffer, of the Munich Art School; J. A. Blankenship, pupil of Chapu, Paris; Lyell Carr, of the Paris Beaux Arts; Mme. L. Prince, of Leeds and Paris; H. S. Barnes, R. Hunter, and others.

Among those who are giving this institution financial support, the following are named:

H. O. Havemeyer has sent to the institute $1,000; H. C. Stimson, $1,400; the Paterson Silk Guild has contributed $1,400 toward the coöperative fund; further contributed to by the New York jewellers, $1,200; George Burnham of Philadelphia, $2,400; and by many New York firms and manufacturing companies, including Tiffany, Gorham Manufacturing Co., Whiting Silver Co., Durand, Sloan, Cottier, Herter Bros., Cheney Bros., Terra Cotta Co., Phœnix Company. The Dry Goods Economist has sent and set up a loom in the institute, and the Silk Guild will furnish an instructor who will teach the students how to apply to the machine the designs they create, furnishing thus the nucleus of a textile school which is founded upon an organic basis. Many of the larger dry goods dealers have expressed a strong interest in this branch of the institute work, and have promised it pecuniary support once it is actively put in operation.

Of the students who have received instruction at the institute several noteworthy successes are already reported:

Mrs. S. Vedder, after two years of training with Mr. Stimson, went to Paris, at once stepped to the head of the École des Beaux Arts, took three medals, and has been accepted in the Salon. Two young students, without consulting Mr. Stimson, entered the competition for the New York Herald prizes, offered to all students of different schools

in the country for best work in illustration and pen work for press printing. Among four hundred competitors they took the first and second prizes. A graduate from the institute, now one of Tiffany's best designers, gratuitously teaches in the evenings a class of metal workers at the institute. * * *

With such a corps of instructors, with such an equipment, with such financial backing, and with such a spirit animating its students the prosperity of this institute seems assured.

From a commercial and industrial point of view, the necessity of the best art instruction for artisans is becoming more and more a demand of the times. In an article of the New York Times of May 6, 1891, the failure of American manufacturers of textile fabrics to reach the standard of excellence attained by their foreign rivals is attributed to the inferiority of American designs, color combinations, and factory work.

SCHOOL OF INDUSTRIAL ART AND TECHNICAL DESIGN FOR WOMEN.

The School of Industrial Art and Technical Design for Women in New York city owes its origin and prosperity to the intelligent purpose and energetic management of its principal, Mrs. Florence E. Cory, who, in October 1881, organized her first class of five pupils, instructing them in the principles of design and the practical application of those principles to industrial art.

This institution is said to be the only school of practical design for industrial manufacture in the world. In other schools of design the teachers might teach a young lady to make a wall paper design; set her down with paper, brushes, and colors, she might make a beautiful design, but would not know (neither would the teachers) whether that design could be printed by machinery or not. She would not know how many colors she should use, how the colors should fall, the dimensions, or anything of the kind; the teachers do not know. A design may be well executed, faultlessly correct, and beautiful, yet worthless to the manufacturer because it cannot be woven or printed. Machinery has its requirements and its limitations, all of which must be considered when making a design, and without the practical knowledge necessary to do this an acceptable working design cannot be made.

In this school pupils are made practically familiar with the workings of machinery and the technicalities of design as applied to various industries, as carpet designing, wall paper, oil-cloth, linoleum, lace, chintz, silk, calico, leather, book covers, etc.

Two years are required for the completion of the full course of instruction. The first year classes are taught simple designing for calico, muslin, stained glass, inlaid woods, jewellery, etc. In the second year the pupils learn advanced designs for oil-cloth, silk, carpets, etc. Some pupils attend a postgraduate course of one year. During the year no formal instruction is given, but orders are received and work

is done by the pupils under the supervision of the principal and well-known designers.

The principal writes, under date of August 6, 1891:

By far the greater number of graduates are at work in their own homes, and are not employed regularly at a stated salary by any manufacturer. When their designs are finished they are sold to whichever manufactory pays the highest price.

ART ACADEMY, CINCINNATI.

The Art Academy of Cincinnati, Ohio, is devoted principally to the teaching of drawing and painting, but also to modelling, decorative design, wood carving, china painting, etc.

Mr. J. H. Gest, assistant director, writing under date of August 6, 1891, states:

The aim of the school is to give artistic rather than industrial training, though many students acquire here a skill as draughtsmen that is afterward of service to them in trades, especially in designing. As an instance of this I may refer to the Rookwood pottery, which has acquired considerable reputation for its decorated ware in Europe as well as in this country. All of the decorators employed there are pupils of our academy, and all continue to attend the night classes.

About 400 students annually receive instruction in drawing, painting, and decorative art.

OHIO MECHANICS' INSTITUTE.

The Ohio Mechanics' Institute of Cincinnati has been in existence since 1828, and it is, therefore, one of the oldest of the schools of industrial art in the country, as it is one of the best.

It has six departments, viz., mechanical, for engineers, metal workers, machinists, patternmakers, blacksmiths, etc.; architectural, for architects, carpenters, masons, wood workers, builders, etc.; artistic, for free-hand drawing, perspective, crayon, etc., for painters, carvers, cabinetmakers, etc., including instruction in designing as applied to the manufacture of furniture, jewellery, silverware, carpets, lace and damask hangings, etc.; practical mechanics; carriage draughting; mathematics—chiefly to aid work in other departments.

Since its foundation 9,371 members have been enrolled in the institute. During the school year 1890–'91 there were 720 names on the roll.

TECHNICAL DRAWING SCHOOL, PROVIDENCE.

The Technical Drawing School of Providence, Rhode Island, of which Mr. G. C. Anthony is director, was established in 1887 for the purpose of giving instruction in engineering and architecture, which, while extending over ten months only, should furnish a thoroughly practical technical training.

The director, writing under date of June 24, 1891, sends an incomplete list of the former students of the school, with the present occupation of each. The list contains 22 names. Of these pupils 20 had become draughtsmen, 1 was an architect, and 1 a civil engineer.

RHODE ISLAND SCHOOL OF DESIGN.

The Rhode Island School of Design at Providence was opened in 1878, and in the year 1891 the number of students in the school was 341. In the department of free-hand drawing there were 216, in that of mechanical drawing 125. There were 8 in the graduating class.

Painting, modelling, and wood carving are also included in the courses of study. The course in each department is of three years' duration. There are eight instructors. A new building is now being erected for the school.

ART AND DRAWING SCHOOL, SAINT LOUIS.

From Mr. G. A. Schenk of Saint Louis, Missouri, we have received a circular descriptive of the Art and Drawing School conducted by him in that city.

It appears that there are the following classes under his management: Night school for free-hand drawing (Tuesday and Thursday), from 7 to 9 p. m.; school for machinery, perspective drawing, etc. (Wednesday and Friday), from 7 to 9 p. m. Day school for drawing (daily, except Saturday), and school for carving and modelling (daily, except Saturday). Sunday school for drawing, carving, and modelling, and every Saturday drawing classes for boys and girls.

The principal writes us, under date of August 26, 1891, that within the past fifteen years he has had over 3,000 pupils in the school. Among those who have attended this private school are lithographers, engravers, architects, carvers, modellers, designers, draughtsmen, etc.

LOWELL SCHOOL OF PRACTICAL DESIGN.

The Lowell School of Practical Design, Boston, Massachusetts, established in 1872 for the purpose of promoting industrial art, is now under the control of the Massachusetts Institute of Technology. Tuition is free to all pupils.

The school occupies a drawing room and a weaving room in the building of the institute on Garrison street. The weaving room affords students an opportunity of working their designs into actual fabrics of commercial sizes and of every variety of material and of texture. The room is supplied with two fancy chain looms for dress goods, three fancy chain looms for fancy woollen cassimeres, one gingham loom, and one Jacquard loom. The school is constantly provided with samples of all the novelties in textile fabrics from Paris, such as brocaded silks, ribbons, alpacas, armures, and fancy woollen goods.

The course is of three years' duration. The number of students in this department is limited to sixty-five.

MICHIGAN MINING SCHOOL.

A technical school of high rank, called the Michigan Mining School, is located at Houghton. It might with propriety be called a specialized technological school, as its work is essentially the same as that in the mining engineering course of institutes of technology. It is especially organized to afford training and instruction for the following classes:

(1) Those desiring a practical professional education in mining engineering, particularly graduates of colleges or schools in which a more general or literary education is given.

(2) Persons desiring as special students to take certain subjects as an aid in their practical work.

(3) Persons wishing as special students to obtain a knowledge of some science taught here for purposes of general education, or for use in teaching, or as an aid in some other professional course.

The course of instruction leads directly to a profession. The class of 1890 consisted of seven members. Of these four are reported as mining engineers, and one as a civil engineer. The equipment of the laboratories and shops of this institution is ample.

AGRICULTURAL COLLEGES.

Intermediate in grade between the manual training school and the technological institute are the agricultural colleges of the United States. The department of agriculture has published a complete list of the schools and colleges of this class in forty-three states and territories. From an examination of the courses of study pursued in these institutions it appears that eleven of these colleges of agriculture and mechanic arts in this country, namely, those of Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Ohio, Rhode Island, South Carolina, Tennessee, and West Virginia, hold out the promise of the degree of bachelor of arts to such as complete a prescribed course.

There are about sixty institutions in the United States devoted to agriculture and the mechanic arts, but not all of these are of collegiate rank. The state of Georgia has six agricultural colleges, but only two of them have power to confer degrees of any kind. It is hoped that a symmetrical development of the two coördinate departments of the land-grant colleges may soon be witnessed, and that neither department may be overshadowed by abnormal growth on the part of the other.

We append a list of these schools, by states, with an outline of their courses of study.

ALABAMA.

The Alabama Polytechnic Institute, located at Auburn, was organized under the provisions of the land-grant act of 1862 by an act of the state legislature in 1879 as a state agricultural and mechanical college. It has received considerable aid from the state from time to time. Its teaching staff now numbers eighteen. There are five courses of study, three of which require four years each for completion, and lead to the degree of bachelor of science, viz., course in chemistry and agriculture, course in mechanics and engineering, and general course. The remaining courses, requiring but two years each, are the course in agriculture and the course in mechanic arts.

The college affords to its students a three years' course in manual training, consisting of lessons in carpentering and turning in the first year; patternmaking, moulding and casting in iron and brass, and forge work in iron and steel in the second year; and chipping, filing, and machine work in the third year. The work is obligatory with the preparatory and with the two lower academic classes, each student being required to take three exercises a week of two hours each in mechanic arts. With the junior and senior classes the shop work is optional.

The State Colored Normal and Industrial School at Huntsville was organized in May 1875. It has been aided freely by the state from the first, as well as by liberal contributions from the Peabody education fund, the John F. Slater fund, and private subscriptions. It was by the Alabama general assembly of 1890–'91 made the beneficiary of that part of the congressional grant, given under act approved August 30, 1890, "to the more complete endowment and support of the colleges for the benefit of agriculture and the mechanic arts."

Instruction is given under the department of mechanic arts in carpentry, printing, mattress making, and shoemaking; under the department of agriculture, in farming and horticulture, and in dairy and live stock; and under the department of domestic industries, in laundry work, cooking, cutting and sewing, nursing, and housekeeping.

The number of students and the time devoted to the work in the various branches are shown in the following table taken from the catalogue of 1890–'91:

Subject.	Students.	Hours per day.	Days per week.
Carpentry	6	2	3
Printing	8	2	3
Mattress making	3	2	6
Shoemaking	6	2	3
Farming and horticulture	28	2 to 8	6
Dairy and live stock	5	2 to 8	6
Laundry	15	2 to 4	6
Cooking	18	2	2
Cutting and sewing	21	2 to 4	2
Nursing	18	.....	2
Housekeeping	22	.....	2

In addition to the above work in classes regularly organized for special instruction, all receive lessons in domestic affairs.

All of the departments contribute in some way to the equipment of the institution, and are in most cases a source of income to the student as well as a means of training.

The North Alabama Agricultural School at Athens has a course of studies which is designed as a preparation for the Auburn college. The faculty consists of the principal and two professors.

At Abbeville is located the Southeast Alabama Agricultural School. In all there are five teachers, and the school is preparatory for the college at Auburn.

ARIZONA.

At Tucson there has been recently organized an agricultural university. Courses of study are not yet announced.

ARKANSAS.

The Arkansas Industrial University, a state institution, is located at Fayetteville.

There are twenty-five in the teaching staff, and there are eight courses of study. The agricultural course of four years leads up to the degree of bachelor of scientific agriculture. There is also a two year's course in agriculture, but leading to no degree. The degree of mechanical engineer is conferred on students who have pursued a four years' course in that branch. The two years' manual training course does not entitle one to a degree. A four years' course in civil engineering leads to the degree of civil engineer, a scientific course of the same duration leads to the degree of bachelor of science, and a classical course of four years leads to the degree of bachelor of arts. There is, besides, a normal course of two years leading to a certificate of proficiency.

A course of manual training has recently been established, extending through the four years of collegiate study, and in close relation with the theoretical teaching. Five hours a week are given to drawing and ten hours a week to the shop work. The subjects taught in the training shops are carpentry and joinery, wood turning, cabinetmaking, patternmaking, foundery work, forging, metal fitting, machine tool wook, and care of steam machinery.

The equipment of the training shops is excellent. In the wood working shop there are 18 benches with tools, 7 turning lathes, circular saw, scroll saw, band saw, planing machine, etc. The forge shop has 9 forges and all needed appliances. The machine shops have 13 benches with vises, sets of tools, etc. The foundery has a Collan cupola with a capacity of a ton of iron.

Seventy-five students can be accommodated in the shops at one time, divided among the rooms as follows:

Wood working room	24
Metal working room	18
Forging room	9
Foundery	20
Tool room	1
Engine and boiler room	3

The department of manual training in this university has been in operation for so short a time that there have been no graduates from the school.

CALIFORNIA.

At the College of Agriculture of the University of California, located at Berkeley, there is a four years' course of study, which leads to the degree of bachelor of science. Special students, also, are received. The faculty includes nineteen professors, six instructors, and fifteen assistant and other officers.

COLORADO.

The State Agricultural College of Colorado is located at Fort Collins. There are ten members of the faculty. The courses of study are two —the agricultural and the mechanical—each leading to the degree of bachelor of science. Only two years are required to complete either of the courses in addition to three years of preparatory work.

The department of practical mechanics gives a systematic and progressive education in the use of tools and materials. It does not teach special trades, nor manufacture salable articles. So, without teaching any one complete trade, the mechanical principles of many are gained.

The shop instruction includes courses of 13 weeks each in bench work in wood, and iron and steel forging, and courses of 12 weeks each in wood turning, patternmaking, moulding and casting, machine work in metals, and vise work in metals.

This course consists of exercises with the different wood working bench tools, so arranged in a graded series as to embrace the manipulation of the tools in their various applications.

The first class, consisting of three members, was graduated in 1884. One of the graduates is a farmer and veterinary surgeon, another is a stockman, and the third, a woman, is married and at home. There were six members of the class of 1885. Five of them were women, four of whom are accounted for as at home, and the other one is a professor in the state college. The one male graduate is assistant to the state meteorologist, at the experiment station. The class of 1886 had only one member. Four members belonged to the class of 1887. One is an engineer, one a librarian, one a county clerk, and one is at home. The class of 1888 had four members. One is a farmer, one a superintendent of an experiment station, one a teacher, and one a student

abroad. The class of 1889 had but two graduates. One is a farmer, and one a student. Nine students were graduated in 1890. Two are students elsewhere, two are at home, one is an engineer, one a clerk of a county court, one a teacher, one an instructor in irrigation, and one a professor of botany and horticulture in Wyoming.

CONNECTICUT.

The Sheffield Scientific School of Yale University at New Haven is one of the institutions deriving income from the fund created under the land grant act of 1862. The teaching staff includes thirty-eight professors and assistants.

The courses of instruction occupy three years, leading to the degree of bachelor of philosophy. The first year's course of study is the same for all. For the last two years special courses in chemistry, in civil engineering, in mechanical engineering, in agriculture, in natural history, in biology preparatory to medical studies, in studies preparatory to mining and metallurgy, etc., are provided.

The state of Connecticut has another technical institution of a lower grade at Mansfield, known as the Storrs Agricultural School. The faculty consists of the principal and five assistants. The course of study requires three years, but leads to no degree. The course includes general and agricultural chemistry, natural philosophy, farm mechanics, elementary geometry, land surveying, botany, zoölogy (including especially domestic animals and insects injurious to the crops of the farm and garden), geology, human and animal physiology, agriculture, farm accounts, stock breeding, milk production, arithmetic, and English. Work on the farm of the school forms part of the required course.

DELAWARE.

Delaware College at Newark has a faculty of eight professors. There are five courses of study, viz., the classical and the Latin scientific course, each leading to the degree of bachelor of arts; the course in modern languages and sciences, leading to the degree of bachelor of science; the course in engineering and science, leading to the degree of civil engineer; and the agricultural course, leading to a certificate of graduate in agriculture. The first four courses require four years each; the last, three years.

FLORIDA.

Lake City is the seat of the Florida State Agricultural and Mechanical College. It was established in 1884, and has military and manual training departments. Nine professors are on the teaching staff. There are two courses of study, each requiring four years for completion. The classical, literary, and scientific course leads to the degree of bachelor of arts; the agricultural and mechanical course to the degree of

bachelor of science. There is also a course leading to the degree of civil engineer. Tuition is free to all citizens of Florida.

Concerning the effect of the act of Congress passed March 2, 1887—the Hatch bill—it is stated in the catalogue of this college for 1890–'91, that—

The funds appropriated by Congress under the Hatch bill have become available, and experimental work, in accordance with the provisions of that bill, began during the session of 1887–'88.

During the past year many important improvements have been made, such as clearing the ground, erecting needed buildings, fencing, stocking with thoroughbreds and grades of every description, and experiments extensively carried on with fertilizers and all sorts of crops.

* * * * * * *

Nine of its bulletins, already published, furnish a partial exhibit of what has been done, which promises most valuable results to the farmers and fruit growers of the state. * * * This fund * * * greatly increases our facilities for teaching the natural sciences and practical agriculture, and our students are thus directly benefited through its use.

The manual training department is equipped with tools, engine, etc. The college printing office is fully equipped with two good presses, a large cutting machine, and a full line of plain and ornamental type, so that a cadet may become a practical printer in a short time without any expense.

The course of instruction extends through four years. The shop work includes the use of wood working tools during the first year; for this work twenty-three double benches are provided with forty-six sets of tools. The second year is devoted to patternmaking and moulding, sheet metal work, brazing, and soldering. The third year is devoted to forge work. In the fourth year the use of machine tools for metal work is taught.

Only students regularly qualified to enter the freshman class of the agricultural course will be permitted to take manual training, but for all taking the agricultural course it is obligatory. No student will be permitted to take drawing without the shop work, or *vice versa*.

GEORGIA.

At Athens is situated the Georgia State College of Agriculture and Mechanic Arts. There are thirteen in the faculty. The courses of study are three, each requiring four years for completion, viz., a course for the degree of bachelor of agriculture, a course for the degree of bachelor of engineering, and a course for the degree of bachelor of chemical science. In the engineering department there is also a partial course, known as the course in building and architecture, leading to a certificate of attainments.

The Middle Georgia Military and Agricultural College at Milledgeville has a course of study preparatory to the University of Georgia. Elect-

ive and commercial studies are provided. There are twelve in the faculty.

The North Georgia Agricultural College is located at Dahlonega. Eight persons make up the teaching staff. The course of study requires four years for its completion and leads to the degree of bachelor of arts. Partial courses, also, are provided, leading to certificates.

The South Georgia College is at Thomasville. There are seven members of the faculty. The course of study is preparatory to the University of Georgia, including two years' work of the university grade.

The Southwest Georgia Agricultural College is located at Cuthbert. The function of this college is to prepare students for the University of Georgia, with two years' university grade work. There are five in the faculty.

The West Georgia Agricultural and Mechanical College is at Hamilton. The faculty consists of three members, and the course of study is merely preparatory for the University of Georgia.

ILLINOIS.

The University of Illinois at Urbana has a college of agriculture. The faculty is composed of fifteen professors. There are two courses of study—the full agricultural course of four years, leading to the degree of bachelor of science, and the farmers' course of one year, leading to no degree. There is a school of mechanical engineering whose aim is to fit students to invent, design, construct, and manage machinery for any branch of manufacture.

In the department of mechanical art and design instruction is given and practice afforded in five different shops, viz., patternmaking, blacksmithing, foundery work, bench work for iron, and machine tool work for iron. The mechanical building of this institution is of brick, 126 by 88 feet. It contains a boiler room, a machine shop with lathes and other machinery, a pattern and finishing shop, carpentry and cabinet shops, and a blacksmith's shop, 32 by 36 feet, furnished with forges, anvils, and tools, and having a cupola for melting iron.

This university was chartered in 1867, and opened to students in March 1868.

INDIANA.

At La Fayette is situated the School of Agriculture of Purdue University, a state institution, with free tuition to residents of Indiana. Thirty-five professors and instructors constitute the faculty. The four years' course of study leads to the degree of bachelor of science, and includes instruction in horticulture and veterinary science.

IOWA.

The Iowa State College of Agriculture and Mechanic Arts at Ames has a faculty of twenty-six professors and instructors. There are five

courses of study, viz., the course in science and agriculture, leading to the degree of bachelor of science; the course for ladies, leading to the degree of bachelor of letters; the course in mechanical engineering, leading to the degree of bachelor of mechanical engineering; the course in civil engineering, leading to the degree of bachelor of civil engineering; and the course in veterinary science, leading to the degree of doctor of veterinary medicine. This last course requires three years' study; each of the other courses, four.

This institution at first adopted the Russian system of training to the performance of isolated and fragmentary parts of a complete work, but this plan has been abandoned and the manufacturing system substituted for it.

KANSAS.

The Kansas State Agricultural College at Manhattan has a regular course of study, requiring four years for completion, and leading to the degree of bachelor of science. Special and postgraduate courses are provided, also. The faculty and other officers number twenty-one.

KENTUCKY.

The Agricultural and Mechanical College of Kentucky is at Lexington. The teaching staff consists of seventeen members. There are four courses of study, each requiring four years, viz., the agricultural and the scientific courses, leading to the degree of bachelor of science; the classical course, leading to the degree of bachelor of arts; and the engineering course, leading to the degree of civil engineer. Normal courses of from one to four years are provided, and there is a commercial and phonographic department, with a principal and four assistants.

LOUISIANA.

The Louisiana State University and Agricultural and Mechanical College is at Baton Rouge. Fourteen professors make up the faculty. There are three four-year courses. The course in agriculture, and the course in mechanics and civil engineering lead to the degree of bachelor of science. The literary course leads to the degree of bachelor of arts. There is a preparatory department, as well as a two years' commercial course, for such as desire instruction of a special character.

MAINE.

The Maine State College of Agriculture and the Mechanic Arts is at Orono. The faculty consists of twelve professors and instructors. There are five courses of study, each of four years. A course in agriculture, a course in chemistry, and a course in science and literature lead each to the degree of bachelor of science; a course in civil engineering leads to the degree of bachelor of civil engineering; and a course

in mechanical engineering leads to the degree of bachelor of mechanical engineering. Special courses leading to certificates are provided.

As in many of the agricultural colleges, mechanical engineering takes precedence of other studies in this institution. Of the graduates from this college it is said that "less than 12 per cent. are found in the learned professions," most of them having adopted mechanical pursuits. "Measured by the money standard, there are graduates whose services are valued at from $3,000 to $6,000 per annum." This college graduated its first class in 1872.

MARYLAND.

The course of study of the Maryland Agricultural College requires four years, and leads to the degree of bachelor of science. Seven professors constitute the faculty.

MASSACHUSETTS.

Amherst is the seat of the Massachusetts Agricultural College. There are fourteen professors, lecturers, and instructors. The course of study requires four years, and leads to the degree of bachelor of science.

The Bussey Institution of Harvard University is located at Jamaica Plain. It is a school of agriculture and horticulture, giving systematic instruction in agriculture, useful and ornamental gardening, and stock raising, and is especially adapted for the instruction of young men who have been brought up as farmers or gardeners, as well as for those who wish to qualify themselves to be farmers or superintendents of farms, country seats, or public institutions, or wish to pursue some special course in agriculture, horticulture, botany, or entomology. There are seven professors and instructors. The course of instruction occupies one year, and if preceded by a preliminary course of one year at the Lawrence Scientific School, or its equivalent, and supplemented by a year of advanced study at the university, leads to the degree of bachelor of agriculture.

During the year 1890-'91 there were seven students taking the agricultural course in this school.

The instruction, briefly summarized, consists of lectures on the following subjects, combined with practical work and experimentation on the Bussey farm—theory of farming, horticulture and floriculture, landscape gardening and greenhouse work, tree culture, agricultural chemistry, botany, with special reference to the needs of agricultural and horticultural students, and entomology.

The farm of 200 acres on which the institution buildings are situated affords ample facilities for practical experiment and observation in the art of agriculture. The farm is devoted primarily to the production of hay, which is consumed upon the farm by horses and cattle taken to board. Students have constant opportunity to observe these animals,

as well as the agricultural operations and the courses of crops by which the fertility of the soil is kept up.

The tuition fee for the academic year at the Bussey Institution is $150, but this is freely remitted to poor and deserving students. A few students are boarded free of cost in consideration of services rendered upon the farm, in the greenhouses, or about the buildings. Estimated expenses, aside from tuition, vary all the way from $200 to $350 per annum.

The Arnold arboretum on the Bussey farm was founded for the purpose of scientific research and experiment in arboriculture, forestry, and dendrology, and as a museum of trees and shrubs suited to the climate of Massachusetts. Students of the institution have free access to it.

MICHIGAN.

There are thirty-one members in the faculty of the Michigan Agricultural College. This institution is located at Agricultural College. The courses of study are two—the agricultural and the mechanical, each leading to the degree of bachelor of science at the end of four years. There is a postgraduate course also.

MINNESOTA.

The College of Agriculture of the University of Minnesota is located at Saint Anthony Park. Professors and instructors to the number of seventeen compose the faculty. The course of study requires five years for completion, and leads to the degree of bachelor of agriculture.

The State School of Agriculture is also located at Saint Anthony Park. The faculty consists of twelve members. The course of study requires two years for completion, and leads to a certificate.

MISSISSIPPI.

The Agricultural and Mechanical College of Mississippi is at Agricultural College. There are nineteen members of the faculty. The course of study covers four years, and leads to the degree of bachelor of science. Preparatory and postgraduate courses are provided also.

The Alcorn Agricultural and Mechanical College at Rodney offers three courses of study, viz., the academic course and the scientific preparatory course, each requiring two years for completion, and the scientific course of four years, leading to the degree of bachelor of science. The faculty is made up of nine officers.

MISSOURI.

The Agricultural and Mechanical School of the University of the State of Missouri is located at Columbia. The faculty consists of eleven members. The agricultural course requires three years for completion, and leads to the degree of bachelor of applied science. A special course in agriculture of one month's duration is provided.

President R. H. Jesse, writing under date of August 6, 1891, says:

Manual training will begin here for the first time in our college of agriculture and mechanic arts next September. Next year (1891-'92) we shall have wood work, the year after iron work. We mean to equip the department well and to manage it properly.

He states, further, that, under direction of Prof. C. M. Woodward of Saint Louis, the institution is making provision for one hundred students.

NEBRASKA.

The Industrial College of the University of Nebraska is located at Lincoln. The faculty has twenty-three members. The courses of study occupy four years each, and are specialized as follows: Electrical course, chemical course, course in agricultural chemistry, course in geology, course in botany, course in zoölogy, course in agricultural biology, and civil engineering course. Graduates of these courses receive the degrees of bachelor of science, bachelor of agriculture, and bachelor of civil engineering. There is also an elementary agricultural course of two years.

NEVADA.

The School of Agriculture of the Nevada State University is located at Reno. There are ten professors in the faculty. The regular four years' course of study leads to the degree of bachelor of science. A short course in agriculture is also provided, requiring five months' attendance each year for four years, but not leading to a degree.

NEW HAMPSHIRE.

At Hanover is located the State College of Agriculture and the Mechanic Arts. Twelve professors and instructors compose the faculty. There are two courses of study, each of four years' duration and leading to the degree of bachelor of science, viz., the course in agriculture and chemistry, and the course in mechanical engineering.

NEW JERSEY.

Rutgers Scientific School of Rutgers College at New Brunswick has twenty-one professors and instructors in the faculty. There are three distinct courses of study, each requiring four years' attendance, and leading to the degree of bachelor of science, viz., a course in civil engineering and mechanics, a course in chemistry and agriculture, and a course in electricity. Besides, there is a special course in agriculture, of two years' duration, leading to a certificate of attainments.

NEW MEXICO.

The Agricultural College of New Mexico is located at Las Cruces. At present the faculty consists of five professors, but additional instructors are to be employed. The college was opened January 21,

1890. The courses of study, as now arranged, include an academic and commercial course, a scientific and literary course, a course in agriculture and mechanic arts, and the classical course.

NEW YORK.

The College of Agriculture of Cornell University at Ithaca has a faculty of eight members, belonging strictly to the teaching staff of this department. But the number of professors, instructors, and assistants teaching some part of the work in the college of agriculture is fifty-one. The regular course of study requires four years' attendance, and leads to the degree of bachelor of science in agriculture. A postgraduate course, leading to the degree of master of science in agriculture is provided, and special courses also are arranged for such as wish to take them.

NORTH CAROLINA.

At Raleigh is situated the North Carolina College of Agriculture and Mechanic Arts. The faculty is composed of eight professors and instructors. This college is of recent organization, and its course of study has not been defined.

NORTH DAKOTA.

The North Dakota Agricultural College is at Fargo. Its organization is not yet completed, and its officers have not been appointed.

OHIO.

Columbus is the seat of the Ohio State University. The faculty consists of thirty-four professors and assistants. In this institution there are three general courses of study, each requiring four years' attendance, and leading, respectively, to the degrees of bachelor of arts, bachelor of philosophy, and bachelor of science. The technical courses comprise a course for the degree of bachelor of agriculture, requiring four years; a three years' course for the degree of doctor of veterinary medicine; a four years' course for the degree of civil engineer; two courses, one in mechanical the other in electrical engineering, each of four years, and leading to the degree of mechanical engineer; a course of four years for the degree of engineer of mines; a course for the degree of graduate in pharmacy, requiring three years; also two years' courses in agriculture and in mining. Postgraduate courses are provided.

OREGON.

The Oregon State Agricultural College is at Corvallis. The faculty is composed of twelve professors. The course of study requires three years, and leads to the degree of bachelor of scientific agriculture.

PENNSYLVANIA.

At State College is located the Pennsylvania State College. There are twenty-two professors and assistants on the teaching force. The

four years' courses of study are as follows: A general science course, a Latin scientific course, a general course in agriculture, an advanced course in agriculture, advanced course in chemistry, course in physics and electrotechnics, course in civil engineering, course in mechanical engineering, course in natural history. The college also provides a course in mechanic arts requiring three years for completion; a ladies' course in literature and science requiring two years; and a special course in chemistry of the same duration. The general course in agriculture leads to the degree of bachelor of agriculture. The other four years' courses lead to the degree of bachelor of science, the diploma designating the specialty pursued.

President Atherton, of the Pennsylvania State College, writing August 6, 1891, states that—

It is only within the last five or six years that the college has paid any special attention to mechanical training. The college was originally founded as a manual labor and agricultural school, and, after many vicissitudes, the manual labor feature was dropped many years ago.

Nearly all our students are engaged in what might be called, generally, the industrial professions. Some of our recent graduates have attained remarkable success, and I attribute that result to the fact that, without sacrificing anything of thoroughness in the theoretical work, we introduce a very large amount of experimental application in connection with it.

RHODE ISLAND.

Brown University at Providence is one of the institutions deriving income from the land grant. Twenty-two professors and instructors constitute the teaching staff. There are five courses of study, each occupying four years. They lead to the following degrees: Bachelor of arts, bachelor of philosophy, bachelor of science, and the degrees of civil engineer and mechanical engineer.

An extended course of study in agriculture is open to all students. It includes special lectures on agriculture relating to the history of agriculture, the study of soils, fertilizers, rotation of crops, etc., and to applied economic zoölogy. Under the latter head are discussed the distinctive characteristics of the most approved breeds of neat cattle, horses, sheep, and swine. Practical instruction is also given upon insects, birds, and animals injurious and beneficial to the farmer and horticulturist.

In May 1892 the Rhode Island State Agricultural School at Kingston was incorporated as the Rhode Island College of Agriculture and Mechanic Arts. This change was followed by certain changes in the course of study and in the character of the instruction. This school as thus reorganized is prepared to fulfil on both the agricultural and mechanical lines the purpose of the land-grant act.

The institution now offers two courses of study of four years each. In the freshman year, and to a great extent in the sophomore year, the work for the two courses is the same. But from the beginning of the junior year the two courses follow lines which have aims clearly different. An outline showing the subjects taken up in the two courses of instruction is given in the following tabular statements:

AGRICULTURAL COURSE.

Subject.	Hours per week.											
	Freshman year.			Sophomore year.			Junior year.			Senior year.		
	1st term	2nd term	3d term	1st term	2nd term	3d term	1st term	2nd term	3d term	1st term	2nd term	3d term
Agriculture	2		2	3				3	4	3		
Agriculture, practical				2								
Algebra	5	4										
Algebra and logarithms			5									
Apiary work										2		
Astronomy											4	
Bench work in wood and wood turning	6	6										
Bookkeeping and business law		5										
Botany, elementary and physiological					4	5		2				
Chemistry						5	7	9	4			
Drawing, free-hand			4	2					a 6			
Drawing, mechanical					2							
English	5	5	3	3	2			4	4			
Forestry and landscape gardening												2
French or German				3	3	3	3	3	3	3		
Geography, physical	3											
Geology, study and excursions											2	4
Geometry		3	3	3								
History	2		2									
Horticulture							4					
Inspection	1	1	1	1	1	1						
Laboratory work, botanical									a 6			
Laboratory work, chemical									6			
Laboratory work, physical				2	2	2						
Levelling and road construction							3					
Levelling and road surveying							3					
Market gardening											3	
Mechanics, agricultural		6						3	a 6			
Mental science												4
Microscopy								2				
Military drill and tactics	3	2	2	2	2	2						
Modelling					2½							
Orations										1	2	
Patternmaking			4									
Physics				3	3	3						
Physiology		3	2									
Political economy and science of government.										4	4	
Surveying						7						
Thesis work												3
Trigonometry					3							
Veterinary science, anatomy, etc										5	4	4
Wood work				3	3							
Zoölogy and entomology							4					
Total	27	35	28	27	27½	28	24	26	27	18	19	17

a Elective.

MECHANICAL COURSE.

Subject.	Hours per week.									
	Freshman year.			Sophomore year.			Junior year.			Senic
	1st term	2nd term	3d term	1st term	2nd term	3d term	1st term	2nd term	3d term	1st term
Agriculture	2		2							
Algebra	5	4								
Algebra and logarithms			5							
Astronomy										
Bench work in wood and wood turning	6	6								
Bookkeeping and business law		5								
Botany					4	5				
Calculus								3	3	3
Chemistry and qualitative analysis						5	7	6		a3
Constructions				6						
Drawing, architectural									2	
Drawing, free-hand			4	2						
Drawing, mechanical					2	3		3	a3	
Electricity and magnetism							3			
Electricity, applied										a3
English	5	5	3	3	2			4	4	
English literature										a3
French or German				3	3	3	3	3	3	a3
Geography, physical	3									
Geometry		3	3	6						
Geometry, analytical							4	4		
Geometry, descriptive							2			
History	2		2							
Inspection	1	1	1	1	1	1				
Iron work					3	3				
Laboratory work, chemical									a6	
Laboratory work, mechanical									2	
Laboratory work, physical				2	2	2	2			
Lathe work							3	3		
Mechanical practice										6
Mechanics, agricultural		6								
Mechanics, theoretical and applied										5
Mechanism, principles of									3	
Mental science										
Military drill and tactics	3	2	2	2	2	2				
Modelling					2½					
Orations										2
Patternmaking			4							
Physics				3	3	3				
Physiology		3	2							
Political economy and science of government.										4
Strength of materials									2	
Surveying						1				
Thesis work										
Trigonometry					3					
Total	27	35	28	28	27½	28	24	26	25	23

a Elective.

The methods of instruction followed pay particular regard practical application of the various branches. Laboratory or sho is given throughout the courses in accordance with the most ap methods. Chemistry, for example, is taken up during the secon The work in general chemistry, in which continued applicati made in the lines of agriculture, physiology and hygiene, etc., is fo by the study of agricultural chemistry, taken up by students agricultural course in their third year. The laboratory work branch consists of such exercises as the analysis of milk, butt cheese, soils, fodder, and fertilizers, tests for poisons in the stom animals, the study of chemical changes in soils, and work in ar digestion.

The instruction in agriculture includes farm management, buildings, tools, crops and their cultivation, soils and drainage, manure and fertilizers, stock breeding and feeding, with lectures upon dairying and specialties in agriculture. The close relation of the school with the agricultural experiment station is of great advantage to it, as the work of the farm and its equipment in the line of stock, tools, etc., may at any time be used in practical illustration of the work of the class room. The instruction in agriculture also includes practical field work in the afternoons. Care is taken in the teaching of other subjects, as chemistry, botany, geology, zoölogy, etc., to show their relations to agriculture. In geology, for instance, attention is given to the study of rocks, their elements, and the processes by which they are changed to soils; the study of soils, soil analysis, and the causes of soil sterility.

In addition to the regular courses just described, during the winter a short course in agriculture and mechanics is offered. Persons taking this course may have special instruction in veterinary science, agriculture, the chemistry of fertilizers, dairying, including milk, butter, and cheese analysis, carpentering, wood carving, iron work, and such part of the regular courses as they may deem best. This course continues through the winter term, about three months.

The tuition at this school is free to Rhode Island pupils. Both sexes are admitted.

SOUTH CAROLINA.

The College of Agriculture and Mechanic Arts of the University of South Carolina is at Columbia. There are twenty-two professors and instructors connected with the institution. The regular courses of study are six in number, each requiring four years for completion, and leading to the degree of bachelor of science, viz., a course of general science, a course of civil engineering, a course of mechanical engineering, a course of agriculture, a course of chemistry, and a course of natural history. There are, besides, four special courses, each requiring two years for completion, and leading to a certificate: A shorter course of applied science, a shorter course of agriculture, a shorter course of general science, and a business course. Elective courses are provided in special cases.

The College of Agriculture and Mechanics' Institute in connection with Claflin University is located at Orangeburgh. The faculty consists of seventeen professors and instructors. There are ten courses of study: The college classical course of four years, leading to the degree of bachelor of arts; the college scientific course of three years, leading to the degree of bachelor of science; the college philosophical course of three years, leading to the degree of bachelor of philosophy. Then there are the college preparatory course and the normal course of three years each, leading to diplomas. The English course requires six years, leading to a certificate. The kindergarten course of one

year also leads to a certificate. The same is true of the four years' English Bible course, the four years' music course, and the three years' art course. Twenty industrial courses are provided.

SOUTH DAKOTA.

The South Dakota Agricultural College is located at Brookings. Nineteen professors and instructors belong to the faculty, and there are also a foreman of the farm, a herdsman, and an engineer. There are three courses of study, each requiring four years for completion, and leading to the degree of bachelor of science, viz., a course in agriculture, a course in domestic economy, and a course in mechanic arts. The two years' course in pharmacy leads to no degree.

Under date of July 7, 1891, the president writes that of the 20 graduates 5 are farmers, 2 lawyers, 3 clerks, 6 teachers, and the occupations of the others are not certainly known. There are only three graduates from the mechanic arts department. Of these 1 is cashier in a bank, 1 teaching blacksmithing and machine drawing, and 1 wood carving and machine shop practice.

TENNESSEE.

The State Agricultural and Mechanical College of the University of Tennessee is at Knoxville. Seventeen professors and instructors constitute the faculty. There are seven courses of study, viz., the literary scientific course, the Latin scientific course, the course in agriculture, the course in civil engineering, the course in mechanical engineering, the course in chemistry, and the course in mining engineering. The college confers the degrees of bachelor of arts, bachelor of science, bachelor of philosophy, and bachelor of agriculture.

TEXAS.

The State Agricultural and Mechanical College of Texas is located at College Station. There are twenty-eight professors and other officers of the institution. The two regular courses of study require four years each, viz., the agricultural course, leading by specialization of studies either to the degree of bachelor of scientific horticulture or to the degree of bachelor of scientific agriculture; and the mechanical course, leading by the same process to the degree of bachelor of civil engineering or to the degree of bachelor of mechanical engineering. Special and postgraduate courses are also provided.

UTAH.

The Agricultural College of Utah Territory is located at Logan. The organization of the college is not yet completed, and courses of study have not been arranged.

VERMONT.

The State Agricultural College of the University of Vermont is at Burlington. The teaching staff includes sixteen professors and instructors.

In the department of agriculture there are four courses of study, viz., the full agricultural course of four years, leading to a degree; a short course in agriculture, requiring two years; a winter school of agriculture, occupying eleven weeks; and a winter course of lectures to farmers, without fee for tuition.

VIRGINIA.

The Virginia Agricultural and Mechanical College is located at Blacksburgh. There are fourteen members of the faculty. The regular courses of study are four, each occupying four years, viz., course in agriculture, leading to the degree of bachelor of scientific agriculture; course in mechanics, leading to the degree of mechanical engineer; a general course, leading to the degree of bachelor of science; and a course in civil engineering, leading to the degree of civil engineer. There is also a business course.

A course of instruction in drawing and in the use of wood working tools has been given to successive classes since 1886, and in the use of iron working tools since 1887. The course runs through three years, and averages six hours of work per week. The school shops are reported to be well supplied with machine and hand tools.

At Hampton is located Hampton Normal and Agricultural Institute. There are sixty-seven members of the faculty, including the instructors in the normal department, the night school, the Indian department, and the separate industrial departments for the men and the women. The course of study occupies three years, but does not lead to a degree.

WEST VIRGINIA.

West Virginia University is located at Morgantown. Sixteen professors and instructors constitute the faculty. Two regular courses of study, each of four years, lead to the degrees, respectively, of bachelor of arts and bachelor of science. In the department of engineering there is a four years' course provided, which leads to the degree of civil engineer. Provision is also made for preparatory and postgraduate work.

WISCONSIN.

The College of Agriculture of the University of Wisconsin is at Madison. There are twenty-one members of the faculty. The course of study in the department of agriculture occupies four years, and leads to the degree of bachelor of agriculture. There are also short courses designed to occupy the student during the winter terms of two years, viz., a dairying course, a milk testing course, a course in butter making, a cheese making course, a course in animal husbandry, one in agricultural chemistry, one in veterinary science, one in horticulture and economic entomology, etc.

MANUAL LABOR IN AGRICULTURAL COLLEGES.

The department of agriculture has published a valuable report entitled, Proceedings of the Fifth Annual Convention of the Association of American Agricultural Colleges and Experiment Stations held at Washington, D. C., August 12 to 18, 1891.

In this bulletin appears a paper prepared by Prof. Massey of North Carolina, and read at the session of August 14, on the subject, "To what extent may manual labor be introduced into the curriculum of land-grant colleges?"

The essayist took the ground that the only manual labor to be required in an agricultural college course is such as may properly come under the head of laboratory work. In his own words:

> Statistics show that in colleges thoroughly equipped for their work, and in which the laboratory methods are used, and the minor manual operations merely incidental, a much larger proportion of the students enter agricultural occupations than from the best of those where compulsory and paid manual labor is the rule.

Further, the writer quotes Prof. Bailey as saying:

> The graduates from the Cornell College of Agriculture, and they are as many as from any *bona fide* agricultural school in the country, all follow agricultural pursuits.

Prof. Massey continues:

> I do not want it to be supposed that I oppose the teaching of all farm operations in an agricultural college. They should be taught, but no further than they are educational and necessary for the proper understanding of the subject at the time in hand, all partaking of the nature of laboratory work. Nothing further than this should be attempted. The effort to make skilful farm laborers at such an institution will necessarily result in failure, lower the educational standard of the college, and as a consequence turn out men with a narrow and incomplete education.

It was shown in the discussion which followed that by actual analysis the purely agricultural colleges were sending 34 per cent. of their graduates back to the farm as actual practical farmers, and that doubtless a larger percentage of the graduates of these institutions followed the profession for which the institutions were maintained than could be claimed for the graduates of the professional schools of any other calling.

EXPERIMENT STATIONS.

Each of the forty-three states and territories mentioned in the foregoing list has at least one agricultural experiment station, either directly connected with its college of agriculture or under the control of the local government, and in several states there are two or more such stations.

LEGISLATION FOR AGRICULTURAL EDUCATION.

It is worthy of note that a fresh impetus was given to the work of the agricultural colleges throughout the country by the act of Congress approved March 2, 1887, providing for the establishment and mainte-

nance of these experiment stations connected with the colleges founded in the several states under the provisions of the act of July 2, 1862.

By this act of 1887 (known as the Hatch bill) the sum of $15,000 was appropriated to each state for the purpose of paying the necessary expenses of conducting investigations and experiments bearing directly on the agricultural industry of the United States. This was made a continuing appropriation to be specially provided for by Congress in the appropriations from year to year.

The act forms an admirable and necessary supplement to the original legislation of 1862, and its effect is apparent in the increased efficiency of the agricultural colleges previously established, and in the rapid development of new institutions of this character in states which had not, prior to the enactment of the Hatch bill, availed themselves of the privileges offered by the land-grant act.

But it is none the less true that an important factor in promoting the forward movement of technical education in America was the land-grant act of 1862, by means of which the colleges of agriculture and the mechanic arts have received in the aggregate more than $16,000,000.

The relative amounts realized by the several states from the sale of land or land-scrip apportionments are quite unequal. The proceeds per acre have varied from 41 cents for Rhode Island to $5.57 for California, and $6.73 for New York. This variation is due, however, to the greater or less skill exhibited by the different states in the financial management and final disposition of their holdings. Under the administration of Mr. Cornell and (since his death) of the Hon. H. W. Sage, the proceeds of the New York state land grant now amount to nearly $5,000,000, and this vast sum constitutes the endowment fund of Cornell University, affording an illustration of the wisdom of the policy, in this instance at least, of giving the whole income to a single institution. Some of the states, it is believed, made a serious mistake in consenting to a distribution of the educational revenue derivable from this source among several collegiate establishments—their well meant impartiality reducing the proportion of each to so small an allowance as to be of little benefit. But, to quote the words of Prof. H. W. Tyler of the Massachusetts Institute of Technology, in the Forum for September 1891:

Although technological schools existed before the passage of the land-grant act; although others have been founded and successfully conducted without its aid; although it has been applied to a great extent to the promotion of agricultural education; and although, finally, the income from it is often but a fraction of the total revenue of the institutions receiving it, yet it can not be doubted that the grant, coming at an opportune time, greatly accelerated the development of scientific and technological education, and thereby contributed materially to the extraordinary industrial progress of the past twenty years. Its authorship is not the least among the public services of Senator Morrill of Vermont.

INSTITUTES OF TECHNOLOGY.

RENSSELAER POLYTECHNIC INSTITUTE.

"Technological education in the United States," remarks Prof. Tyler, in the Forum article before referred to, "may be said to date from the founding of the Rensselaer Polytechnic Institute at Troy, New York, in 1824. Stephen Van Rensselaer, its founder, as a member of the state board of canal commissioners, had been actively interested in the construtiion of the Erie canal.

"Engineering as a profession was unknown; men were educated by the work, not for it. The object of the new institution was the general dissemination of that moderate amount of scientific knowledge which its founder recognized as indispensable to the community. Although conducted at one time as a general polytechnic school, the institute has been from its foundation primarily a civil engineering school, interpreting civil engineering, however, in a sense almost as broad as that which once excluded only military engineering."

The faculty consists of eighteen professors and instructors. The course of study in civil engineering is now the only course of the institute. All the regular members of the institute pursue this course, and the degree conferred is that of civil engineer. It should be stated, perhaps, that civil engineering is understood to include mechanical or dynamical engineering, road engineering, bridge engineering, hydraulic engineering, steam engineering, electrical engineering, mining engineering, and sanitary engineering.

The studies of the course are designed to secure to all the graduates a professional preparation at once thorough and practical. The course of study occupies four years. The number of students in 1890 was 174.

About 1,000 students have been graduated from the institute, including the membership of all the classes from 1826 to 1889. Of these nearly all have followed some branch of engineering as a profession, though a very few are registered as lawyers, professors, etc.

Nothing need be said of the thoroughness of the equipment which the training of this institute supplies; its graduates, from Roebling down, are the best exponents of the school, and attest the value of its instruction.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

The Massachusetts Institute of Technology at Boston was chartered by the state legislature April 10, 1861, and opened in February 1865. This institution receives one-third of the income accruing to Massachusetts from the land-grant fund.

There are twelve regular four years' courses of study, each leading to the degree of bachelor of science, viz., civil engineering, chemical engi-

neering, electrical engineering, mining engineering, mechanical engineering, sanitary engineering, metallurgy, architecture, biology, chemistry, geology, physics. The studies are the same for all courses during the first year; after that divergence begins, with specialization for professional work.

Prof. Tyler writes:

At the end of the first year (*a*) the student must decide which one of the diverging courses to follow, the results of the previous work guiding or restricting this choice. A student can not, for instance, pursue an engineering course without having shown some aptitude for mathematics. At present the drift is toward the mechanical, electrical, and civil engineering courses in the order named, these comprising nearly 70 per cent. of students pursuing full courses.

In the second and succeeding years, the more important features are: First, the progressive substitution of technical for general subjects; second, a corresponding increase in the amount of laboratory work; and finally, the gradual introduction of more or less independent original work, scientific research, technical investigation, or constructive design. Thus, in the fourth year of the course in mechanical engineering, the student devotes himself almost entirely to more advanced technical work, either in mill or marine engineering, or in locomotive construction. Laboratory work takes the form of tests of boilers, pumps, and so on, followed by an investigation to be embodied in the graduating thesis. It may be added that the engineering laboratories are in no sense "toy workshops." Among the apparatus for experiment are, for example, a 150-horse power engine, and a testing machine capable of breaking full-sized beams up to 25 feet in length.

Shop work occupies a strictly subordinate position. Its object is to impart some familiarity with tools and with materials, not to produce skilled mechanics. Regular instruction is supplemented, but not superseded, by excursions to manufactories.

A noteworthy characteristic of the curricula of the engineering courses is the unity secured by basing all upon a nearly uniform foundation, not merely of mathematics and physics, but of an extended course in mechanics and the strength of materials, with laboratory work. All regular students receive systematic instruction in literature, history, and political economy, as well as in modern languages.

The following is an outline of the course in mechanical engineering:

COURSE IN MECHANICAL ENGINEERING.

First year.

First term.			Second term.		
Subject.	Weeks.	Hours per week.	Subject.	Weeks.	Hours per week.
Solid geometry	8	4	Plane and spherical trigonometry.	10	5
Algebra	7	4	General chemistry; qualitative analysis.	15	6
General chemistry with laboratory work.	15	7	Political history since 1815	15	2
Rhetoric and English composition.	15	2	French (or German)	15	3
French (or German)	15	3	Mechanical drawing and descriptive geometry.	15	6
Mechanical drawing.	15	6	Free-hand drawing	15	2
Free-hand drawing	15	1	Military drill	.....	.....
Military drill	.....	.....			

a Now at the end of the first half-year.

COURSE IN MECHANICAL ENGINEERING—Concluded.

Second year.

First term.			Second term.		
Subject.	Weeks.	Hours per week.	Subject.	Weeks.	Hours per week.
Principles of mechanism	15	2	Mechanism: gear teeth; machine tools; cotton machinery.	15	3
Drawing	15	2	Drawing	15	6
Carpentry and wood turning	15	4	Pattern work	15	2
Analytic geometry	15	3	Differential calculus	15	3
Descriptive geometry	15	5	Physics	15	3
Physics	15	3	English literature and composition.	15	2
English literature	15	1	German (or French)	15	3
American history	15	2			
German (or French)	15	3			

Third year.

Steam engineering; valve gears; thermodynamics.	15	3	Steam engineering; boilers	15	3
Drawing	15	6	Drawing, design, and use of surveying instruments.	15	6
Forging	15	6	Engineering laboratory	15	2
Integral calculus	5	4	Forging; chipping and filing	15	4
General statics	10	2	Strength of materials; kinematics and dynamics.	15	3
Physics: heat	8	2	Physical laboratory	15	2
Physical laboratory	7	2	English composition	15	2
German (or French)	15	3	German (or French)	15	3

Fourth year.

Steam engineering	8	2	Hydraulic motors	15	2
Hydraulics	7	2	Engineering laboratory	15	4
Dynamics of machines	9	3	Machine-tool work	12	6
Machine design	15	8	Strength and stability of structures; theory of elasticity.	15	3
Engineering laboratory	15	4	English composition	15	2
Chipping and filing; machine-tool work.	16	6	*Options.*		
Strength of materials; friction	15	3			
Metallurgy of iron	15	1	Marine engineering	15	3
Heating and ventilation	15	1	Locomotive construction	15	3
Elements of dynamo machinery	.....	.....	Mill engineering	15	3
Options.			Naval architecture	15	6
Marine engineering	6	2			
Locomotive construction	6	2			
Mill engineering	6	2			
Naval architecture	15	8			

The tuition fee is $200 per year. Applicants for admission to the institute must be 17 years of age, and must sustain an examination in arithmetic, algebra, plane geometry, and history, English language and literature, and in French or German.

VANDERBILT UNIVERSITY.

At Vanderbilt University, Nashville, Tennessee, in addition to the regular academic course of study, there are various professional departments, with only one of which we are now concerned, viz., the engineering department, in which are twenty-two professors and instructors. This department comprises three professional schools, namely, the schools of civil, mechanical, and mining engineering. A four years'

course in either of these schools leads to the degree of bachelor of engineering; but a fifth year's course is provided for such as choose to pursue advanced studies. The first year studies are the same for the three engineering classes, but in the second year the courses diverge toward the several specialties. The work laid out for each branch of engineering is essentially identical with that of all first class schools of this kind, though more attention is given to modern languages—French, German, and Spanish—than in most schools of engineering.

Tuition in this department is $50 per annum, and necessary expenses, all told, amount to $200 per annum and upward, according to the habits and mode of living of the individual student. Special students are admitted to partial courses in this department. The whole number of students in the engineering courses in 1890–'91 was 55.

LAWRENCE SCIENTIFIC SCHOOL.

As befits a great university, Harvard offers facilities for the successful prosecution of special and professional studies of every description. The Lawrence Scientific School, for example, is a department of this university in which the following courses of technology may be pursued: Civil and topographical engineering, chemistry, geology, biology, and electrical engineering. The course of study in each of these branches extends through four years and leads to the degree of bachelor of science, the course of study for which the degree is given being specified in the diploma. There were 88 students in the different classes of the Lawrence Scientific School in the academic year 1890–'91.

LAFAYETTE COLLEGE.

Technical courses of instruction are provided at Lafayette College, Easton, Pennsylvania.

The civil engineering course, leading to the degree of civil engineer, is comprehensive and thorough, including not only studies in civil engineering, but topographical, hydraulic, and mechanical engineering. Its object is to give its students such instruction in the theory and practice of engineering as to qualify them for immediate usefulness in the field and office, and, after a moderate amount of actual practice, to fill positions of trust and importance in their chosen profession.

The location of Easton is most favorable for an engineering school. The city is at the junction of the Delaware and Lehigh rivers, and is a great centre for railroads, canals, bridges, founderies, pipe works for water, gas, etc., rolling mills, repair shops, and many other industrial works.

The mining engineering course, leading to the degree of engineer of mines, includes instruction in topographical and mechanical engineering, mining, chemistry, metallurgy, and in other studies essential to the thorough preparation of the student for mining and metallurgical work.

Iron mines are close at hand, and the anthracite coal mines and zinc mines are easily accessible; these, with the extensive quarries of limestone, steatite, and slate in the vicinity, offer excellent opportunities for the study of mining and quarrying operations.

The chemistry course includes lectures, text book study, and laboratory practice, and leads to the bachelor of science degree. An electrical engineering course was organized in 1889, conferring the degree of electrical engineer on those who graduate in the course. Each course extends through four years.

UNIVERSITY OF CINCINNATI.

A four years' course in civil engineering is open to students at the University of Cincinnati, of Cincinnati, Ohio. This is the only technical department of the university now in active operation, though provision for other special studies is soon to be made.

A peculiarity of the university is that all departments of it are virtually a part of the public school system of the city. Instruction in the university, as in the high schools, is free to all residents of the city. Even necessary expenses, such as laboratory fees, are reduced to the lowest practicable limits. There is not a family in the municipality that may not educate its sons and its daughters thoroughly without charge at every stage from childhood to manhood and womanhood. The income from the endowment funds of the University of Cincinnati is augmented by an annual city levy of one-tenth of a mill.

LELAND STANFORD JUNIOR UNIVERSITY.

The first school year of the Leland Stanford Junior University at Palo Alto, California, began October 1, 1891, and, as a matter of course, the character and gradation of its educational work in all departments have not yet assumed an ultimate form. Departments and courses of instruction in mining, civil, mechanical, and electrical engineering have been organized.

The purpose of the university, as expressed in its charter, is to establish "such seminaries of learning as shall make it of the highest grade, including mechanical institutes, museums, galleries of art, laboratories, and conservatories, together with all things necessary for the study of agriculture in all its branches, and for mechanical training, and the studies and exercises directed to the cultivation and enlargement of the mind."

WORCESTER POLYTECHNIC INSTITUTE.

The Worcester Polytechnic Institute at Worcester, Massachusetts, though sometimes classed with schools of manual training, is virtually an institution of college rank. The requirements for admission to its *lowest class are fully* equivalent, except as to Latin and Greek, to the

standard of entrance examinations in the best New England colleges. Candidates must be sixteen years old, and must be well prepared in arithmetic, geography, grammar, United States history, French, plane geometry, and algebra as far as quadratic equations. As a fact, the average age of those admitted is over eighteen years, and under that age candidates are seldom mature enough for success in the work required. The faculty deem it advisable that the candidates, before applying, take a full high school course, including, if possible, such knowledge of Latin, Greek, and ancient and mediæval history as is generally required for admission to college.

The courses of study and practice in the Worcester institute are comprised in the following departments, viz., mechanical engineering, civil engineering, chemistry, electrical engineering, physical and political science. The mechanical engineering course occupies three and one-half years; the course in electrical engineering four and one-half years; in each of the other departments three years.

The institute is organized on the same general plan as the European polytechnic schools. Its faculty consists of twelve regular instructors and professors, and eleven assistant instructors. One hundred and ninety-six students were in attendance in the classes of all departments of the institute for the year 1890–'91.

Statistics concerning the graduates of this institute, covering the twenty years, 1871 to 1891, show that more than 90 per cent. of the graduates are engaged in occupations for which their training at the institute specially prepared them.

At the Washburn shops connected with the institute are manufactured for sale machinists' tools, engine and speed lathes, twist drill grinders, emery grinding machinery, hydraulic machinery, direct plunger elevators, accumulators, general wood work, school apparatus, etc. Thus students of the institute have the advantage of practice and training in shops where the actual business of manufacturing salable articles is carried on. They do not merely mark time—they advance.

The cost of tuition is $150 per annum; but several free scholarships are open to Worcester county students, and, under certain conditions, to residents of other parts of the state.

Students who satisfactorily complete the prescribed course of studies in any department of the institute receive at graduation the degree of bachelor of science, the diploma merely designating the department of study which the graduate has pursued.

ROSE POLYTECHNIC INSTITUTE.

The Rose Polytechnic Institute of Terre Haute, Indiana, was founded in 1874 by the late Chauncey Rose of Terre Haute, and was opened March 7, 1883. It is devoted to the higher education of young men in engineering. This term includes all those productive and constructive arts by which the forces and materials of nature are made subservient

to the needs of man, together with the principles which underlie these arts.

The faculty consists of fifteen members, and there are, in addition, six instructors in the various shops. The course of study lasts four years, and a high standard of excellence is required of the student. Tuition is free to residents of Vigo county; all others pay $75 a year each.

This institution has graduated seven classes, including the class of 1891. The class of 1885 consisted of 3 members, all of whom are now engaged in some branch of engineering. The graduates in 1886 numbered 16; of these, 12 follow engineering. In 1887 there were 8 graduates; 5 are engineers. The class of 1888 was composed of 11 members; 9 of them are engineers. In 1889, 9 students were graduated; 8 are now engineers. Fourteen students were graduated in 1890; 12 are engaged in engineering specialties. The catalogue of 1892 states that 8 of the class of 1891 are engaged in various branches of engineering; 3 are students, 2 are teachers, 1 is a draughtsman, 1 is a railroad employé, 1 a confectioner, and there is 1 whose occupation is not given.

STEVENS INSTITUTE OF TECHNOLOGY.

The Stevens Institute of Technology at Hoboken, New Jersey, is essentially a school of mechanical engineering. It has been in operation twenty years, and its reputation is firmly established as one of the best of technological schools. Eighteen professors and instructors make up the teaching staff. The course of study occupies four years. Tuition fees amount to $150 a year for state residents; all others pay $225.

Each senior class has an opportunity to go on an inspection tour, visiting the principal centres of locomotive and machine manufacture, as Philadelphia, Hartford, Springfield, Boston, Providence, Fall River, etc.

The list of alumni who have received the degree of mechanical engineer from this school, as given in the catalogue, contains the names of nearly 400 graduates, most of them now engaged in some branch of engineering.

CASE SCHOOL OF APPLIED SCIENCE.

The Case School of Applied Science at Cleveland, Ohio, was opened September 15, 1881. There are eleven members of the faculty all told.

There are seven regular courses of study: The general course; civil engineering; mechanical engineering; mining engineering; electrical engineering; physics; and chemistry. Each course requires four years' study.

Freshmen must be at least sixteen years old and must satisfy the faculty of qualification.

The whole number of students in the school, according to the catalogue of 1890–'91, was 103; of these, 51 belonged to the freshman class. The whole number of graduates up to 1890 was 41.

One member of the class of 1887 is reported as pursuing postgraduate studies at Zurich. One of the class of 1889 is a student at Heidelberg, and another in Paris. All the rest of the graduates are engineers, chemists, draughtsmen, assayers, or instructors in science. There were 7 members of the class of 1890; 2 are engineers, 2 are chemists, 2 are draughtsmen, and 1 is an electrician. The courses in chemistry are open to students, not candidates for a degree, who desire to prepare themselves for work in special lines.

MISSOURI SCHOOL OF MINES AND METALLURGY.

The Missouri School of Mines and Metallurgy is an institute of technology with civil and mining engineering and metallurgy as specialties. It is a college of the University of the State of Missouri, and is located at Rolla, Phelps county, on the line of the Saint Louis and San Francisco railway, about 100 miles southwest of Saint Louis.

The usual courses in the different branches of engineering are pursued in this school, and degrees are conferred at the end of the three years' courses on graduates in civil, mining, and mechanical engineering.

Certificates of proficiency are given also to such as pass an examination in special studies. The total number of graduates is 46; of these, 24 are engineers, 13 are assayers and chemists, 3 are teachers, 2 are draughtsmen, 1 is an editor, 1 a doctor, and 2 are at home.

UNIVERSITY OF MICHIGAN.

The University of Michigan at Ann Arbor has incorporated shop work with its theoretical engineering courses. It was originally the plan of the trustees to open the mechanical laboratory to all classes of students, but on account of the large number of applicants in excess of the capacity of the shops, it became necessary to limit the admission to engineering students.

With the $9,500 appropriated in 1888–'89 the laboratory has been finished and is now receiving additional equipment. An instructor in forging has been added, so that now in addition to the superintendent there is a skilled mechanic in each of the four shops. The capacity of each of the shops is approximately as follows: Wood room, 18 at one time, 2 sections, 36; iron room, 12 at one time, 2 sections, 24; forge shop, 12 at one time, 6 sections, 72; foundery, 12 at one time, 3 sections, 36; total, 168.

CHAPTER II.

PRESENT STATUS OF INDUSTRIAL EDUCATION IN AUSTRIA.

CHAPTER II.

PRESENT STATUS OF INDUSTRIAL EDUCATION IN AUSTRIA.

MANUAL TRAINING.

In its general outlines the system of education in Austria is almost identical with that of Germany. Its machinery consists of a series of schools, supported wholly or in part by the municipal authority, by the government, or by local societies. There are, for example, kindergartens, primary schools, intermediate, manual training, trade, real, and high schools, gymnasia, etc., forming successive gradations calculated to facilitate the pupil's progress through all the stages of his physical and mental development from infancy to maturity. The relation between the several consecutive grades, however, is not so close as this statement, if left unqualified, might lead one to infer. In Austria, as in nearly all civilized lands, there is a gap between the kindergarten and the primary school (*Volksschule*).

Herr Riss, of Vienna, a member of the provincial diet, who, in the capacity of delegate from Austria, attended the manual training congress held at Munich, September 22 and 23, 1888, and made an interesting report before that body of educators upon the condition of the work school movement in Austria, referred on that occasion to this defect in the school system of his native land.

None but boys from 11 to 14 years of age are now admitted to the school shops supported by the association for the establishment and maintenance of school workshops in Cisleithania (*a*).

The association fully recognizes the existence of the chasm in the system, extending from the first to the fourth class of the primary school; and it is of the opinion that the aims of educational hand work can never be attained until they are expanded in both directions so as to embrace the kindergarten system of Froebel and all grades above it from the first class of the primary school to the highest class of the citizens' school (*Bürgerschule*). It is, according to Herr Riss, a matter for regret that the Austrian schools are not today in a condition to reduce to practical effect this ideal.

The object of the school workshops is, first of all, pedagogic. The aim is to hold the shops in strict and intimate relation with the school

a Cisleithania, this side of the Leytha—a river of that name forming a part of the boundary between Austria and Hungary—is a local appellation of Austria, used to distinguish that country from Transleithania, that is, Hungary.

of theoretical instruction, and it is believed that this purpose is best subserved by selecting for shop construction such objects as the pupil studies about in the school. Naturally, the choice of objects depends upon the kind of school to which the pupil belongs. As has been indicated, the Austrian system is not a rigid one, but is adjustable to varying conditions and circumstances.

Without presuming to decide which method is to be preferred, we note the difference between this system of imparting manual instruction in shops separate and apart from the school, and the method pursued in the manual training schools, for example, at Saint Louis, Chicago, and elsewhere in this country, where shop practice and the ordinary studies of the high school grade are taught conjointly under one roof, and, for the most part, by the same teachers. In Austria no attempt is made to combine in the same institution the discipline of shop work and tuition in the academic branches of the public schools.

In the Austrian school shops, according to Herr Riss, the boys are taught modelling in clay, wood carving, carpentry (bench work), and card work. Each of these exercises, it is explained, has a distinctive educational idea behind it. The first two branches serve to broaden and deepen the knowledge of drawing acquired by the pupil at school. Physical training is the main purpose of carpentry, while card work affords illustrations of the applications of geometry.

The first school shop in Vienna was instituted by the aforementioned association in the Neubau district August 10, 1883. It opened with 60 pupils, classed in two divisions. The second school shop followed on February 16, 1887, with 40 pupils. The erection of school shops is now looked forward to in the first, second, third, fourth, fifth, and eighth districts of Vienna. In the ninth and tenth districts shops are maintained by other societies, whose discipline differs in some respects.

In Simmering, two miles below Vienna, a school shop, patterned after those in Vienna, has been founded through the initiative and sacrifice of the teacher. Wiener-Neustadt, the second largest city of Lower Austria, has, by authority of the diet of Lower Austria, opened a school shop in the teachers' seminary, located there under the directorship of one of the Vienna pupils. School shops have also been recently established at Grätz, Lemberg, Troppau, Bielitz, Niemes, Prague, and Reichenberg, some conducted and equipped according to the Swedish model, but most of them formed on the Vienna system. At Prague, during the vacation time of the school year 1887, a three weeks' course in card work was carried out.

As long ago as 1884, however, a course of manual training for teachers was opened in Vienna. Beginning October 1, in that year, it continued until the end of March 1885, and thirty teachers from Vienna and its suburbs received instruction during the course. The time allotted to work was two hours and a half on two evenings in the week.

Since then this teachers' course has been maintained every year, and,

in all, one hundred and forty teachers from Vienna and its vicinity have enjoyed the advantages of the instruction. During the vacation season of 1887 (from July 18 to August 22) a five weeks' course was conducted in Vienna, open to the teachers from all the provinces of the Cisleithanian half of the empire. Ninety-nine teachers attended this vacation course, of whom 38 were from Bohemia; 10 from Moravia; 13 from Galicia; 5 from Silesia; 16 from Lower Austria; 2 from Upper Austria; 1 from Carinthia; 7 from Carniola; 2 from the Tyrol; and 5 from Küstenland. This shows the lively interest felt by the profession in Austria in the promotion of this branch of instruction.

During the summer course of 1888, 28 citizen school teachers and primary school teachers were in attendance, together with 1 imperial district school inspector, 2 teachers of practice schools, and 1 director of a citizens' school. The working time in this course was seven hours a day, and each hearer was required to choose a principal and a subordinate specialty. It should be added that these teachers worked with untiring zeal, practising both before and after the appointed hours. Almost all of those pursuing the course of 1888 enrolled themselves for the next vacation session. The state grants a subvention for the six months teachers' course of 300 florins ($102.30) a week, and the same sum is now appropriated, through the ministry of instruction, for the vacation course. Royalty, also, has manifested a personal interest in the work of the association, his majesty Emperor Franz Josef I. contributing 200 florins ($68.20) towards its support in 1888.

The association now has more than 300 members, all of whom are active and earnest in promoting the establishment of the school shops.

The teachers of Vienna and, so far as can be ascertained, of Austria, are, by a great majority, friendly to manual training; and the people, so far as public opinion can be known, are in sympathy with the new branch of instruction, recognizing fully the advantages which their children derive from it.

Speaking of the future work of the association, Herr Riss said:

I believe that the association, which has so far confined its activities to Vienna, should now change its tactics, and in the future work for the spread of its cause throughout all Cisleithania by the organization of local associations, by newspaper articles and pamphlets, by aiding in the equipment of school shops, etc.

In this way the promise which I made at Magdeburg last year will be kept, that Vienna, as the most southerly point and centre of the manual training propaganda, will do her full duty.

In conclusion, Herr Riss said:

Vienna and Cisleithania will labor indefatigably, in concert with Sweden, France, and Germany, for the extension and promotion of manual training.

From the official and authoritative statement of Herr Riss we turn to consider next the history of the manual training system in certain municipalities of Austria.

At Budapesth, for example, the organization of manual training schools was effected in 1886. The new system has already almost entirely superseded the repetition schools (*Wiederholungsschulen*) which were formerly so common.

The reasons for the change are given by Herr Josef Körösi, director of the bureau of communal statistics. He says that parents often objected to their children attending the evening school (*Wiederholungsschule*) after working through the day; and, as attendance was optional, the classes were apt to dwindle to very small proportions. At the close of the year only two or three, often only one pupil, would remain in attendance; that is, on paper, while in fact the class had become extinct.

To counteract this evil schools of manual training were instituted, and the attendance of apprentices at these schools was made obligatory. The fact that these schools are properly classified as manual training schools is evident from the description of their function, for they serve to supply apprentices with the theoretical and practical knowledge (of drawing and modelling) which is necessary for admission to a trade school, where they may continue their studies with success. There are also preparatory classes for pupils not sufficiently advanced to pursue the regular course with profit.

The plan of studies in the new schools requires a three years' course. In the preparatory class, six hours a week are occupied with theoretical studies, and four hours with drawing. In the regular course, during the first year, ten hours a week are allotted to the following subjects: Accounts, literature, geometry, free-hand drawing, and modelling. The second and third years carry forward these studies, and physics is added to the curriculum.

Only ten hours a week are devoted in the aggregate to school work during any year of the course; and drawing and modelling include all there is of manual training at Budapesth, for no attempt is made to familiarize students with wood turning or iron working tools.

Under the municipal statute every district must maintain at least one manual training school, and, as a matter of fact, each district has one such school; districts 5 and 6 have two each, and districts 7 and 8 three each—sixteen in all.

The whole number of pupils enrolled in the sixteen schools, for the year 1888–'89, was 7,357. Of this number 5,499 belonged to the schools at the close of the year, and of those belonging there were—preparatory class, 1,808; first year course, 2,195; second year course, 1,120; third year course, 376. Pupils are admitted to the preparatory classes at the age of 9 years and upward, but the average age is from 13 to 17 years. The larger part of the pupils become apprentices of locksmiths, masons, carpenters, tailors, and printers.

At the beginning of the period covered by the report (1885–1889) there were six schools of industrial drawing in the city. In 1889 all but one of them had been discontinued. The attendance at the remain-

ing school has steadily declined from 1,714 in the year 1885 to 986 in 1888-'89. The principal reason for this falling off in numbers is to be found in the fact that the majority of the pupils attend the manual training schools, in which drawing forms a required study.

Another typical Austrian school of manual training is described in the second annual report of the State Imperial School for Artisans at Klagenfurth. We glean from the pages of this report all that is pertinent to our purpose.

The *Kaiserlich-Königliche Staats-Handwerkerschule* in Klagenfurth is essentially a manual training school, since its object is by means of theoretical instruction and practical exercises to impart the knowledge and skill which are desirable as a preparation for learning an industrial occupation, especially a manual trade. The teaching force consists of the director and 9 teachers, and 2 master workmen (1 for wood and 1 for metal work) give practical instruction in the shops.

Architectural, free-hand, geometrical, industrial, and technical drawing, technology, commercial arithmetic and commercial bookkeeping, natural science, a knowledge of materials, religious instruction, geography, business customs, the German language, manual training, and shop work are the subjects taught. The term of study and practice in this school lasts ten months in each year. The number of pupils for the year 1890-'91 was 41. The course requires two years work for its completion.

In connection with the manual training school are two other departments—the public drawing class (in which the instruction lasts seven months, with thirty hours practice each week), and the industrial continuation school, which also gives a seven months' course, with nine hours instruction each week.

During the school year 27 pupils were enrolled in the drawing class, and 147 in the two continuation classes. For admission to the first class of the manual training school, the pupil must be twelve years old. There is no age limit for entrance into the other departments. The school is yet only three years old.

It is unnecessary to attempt making a full enumeration of the Austrian manual training schools, and the only remaining institution of this class to which we shall now direct attention is the *Pädagogium* of Vienna. This is described as "unique of its kind, not only in Austria, but perhaps in the whole of Europe," since it gives "attention to every side of the teachers' training," including in its course exercises in turning and sewing.

It is a normal school organized on a peculiar plan. It was opened in the autumn of 1868, under the directorship of Dr. Frederick Dittes, with a three year's course of instruction. Dr. Emil Hannak, speaking of the school at that period, says: "The *Pädagogium* soon won for itself a reputation reaching far beyond the boundaries of Austria, and was frequently sought by teachers from southeastern Europe."

In 1881 the *Pädagogium* was reorganized. As Dr. Dittes had resigned, Dr. Emil Hannak, director of the seminary established at Wiener-Neustadt, and previously engaged under Dr. Dittes at the *Pädagogium*, was called to the head of the institution, and entrusted with the management of the same.

This institution had its origin in the conviction that the well-being of the public schools depends upon the careful training of the teachers in all that pertains to the acquisition of knowledge, the art of imparting it, and the best methods of instruction, supplemented by experimental practice in teaching under competent supervision.

CONTINUATION AND TRADE SCHOOLS.

Continuation schools (*Fortbildungsschulen*) in the smaller cities assume a general character. Apprentices and young workingmen of all trades are assembled indiscriminately in the same school rooms; and while general subjects of education are imparted to all alike, special theoretical instruction pertaining to the trade of the individual pupil is given to him. For instance, the shoemaker is instructed in the anatomy of the foot, and his drawing models are feet, boots, shoes, etc. The tailor is instructed in the general anatomy of the human body and must draw patterns of clothing according to certain measurements, and so on for all the other trades where feasible. But no practical instruction is given, no actual tuition in the use of tools.

In the large cities like Vienna, for example, every prominent trade has its own *Fortbildungsschule*, supported by the guilds composed of the owners of trade establishments. Thus there are schools for carpenters, joiners, turners, painters, printers, confectioners, watchmakers, locksmiths, etc.

This tendency to establish special schools is seen in Vienna in a *Fortbildungsschule* for restaurant waiters. In this school instruction is given in French, in deportment, in the first principles of calisthenics, and in rapid commercial calculation. The school is supported by hotel keepers and restaurant owners, who send there, for a few hours each day, boys that wish to become expert waiters.

Gewerbeschulen are true trade schools of a high grade. A pupil entering one of these becomes a full-fledged workman at graduation. All *Gewerbeschulen* in Austria are conducted in strict accordance with one model—the *Gewerbe-Museum* in Vienna, which exercises a general supervision over that class of schools. All the drawing and clay models are the same throughout the empire, and it may be safely asserted that when one has seen one school he has virtually seen all of them.

These schools are scattered over the whole of Austria, and they are located mainly with a view to supply the wants and necessities of the geographical position. The schools for weaving and knitting and the manufacture of textiles in general are nearly all located in Bohemia,

Moravia, and Silesia, the inhabitants of the provinces named having pursued these industries from time immemorial.

The schools of artistic wood carving are found for the most part in the Tyrol and in Styria and Carinthia, whose inhabitants are apparently endowed by nature with a special talent for this class of work.

Schools for the building trades, etc., may be found everywhere, while schools for special trades are located in certain isolated spots where it is deemed necessary by the government to create or foster home industries.

All recognized trades and branches thereof are represented by schools, for example, of the art trades, building trades, machine industry, chemical industry, textile industry, lace making, every species of wood working, stone and marble cutting, willow working, pottery, brass working, glass industry, gunsmithing, locksmithing, watchmaking, iron and steel industry, musical instrument making, of jewel manufacturing, and of leather working.

In order to exemplify the methods of instruction pursued in the Austrian trade schools and to convey to the mind of the reader a distinct idea of the variety of branches taught and the results attained in the *Fachschulen*, we select a few of the establishments of this character for detailed description, beginning with the school of the wood working industry at Bruck.

The school year 1890–'91, which the present report covers, is the tenth of the existence of the Royal School of the Wood Working Industry (*Kaiserlich-Königliche Fachschule für Holzindustrie*) at Bruck on the Mur. The school year began September 15, 1890, and closed July 31, 1891. During the year 34 regular trade pupils (*Fachschüler*) were enrolled, of whom 26 were in the division for joiners and furniture makers, 7 in the carpentry division, and 1 in the turning department. Six of the number were new members, and 28 were hold-overs from the preceding year. Of the whole number 2 are dead, 2 left the school in the course of the year and chose a different calling, and 30 remained to the close of the year.

In addition there were 17 young people in attendance as extraordinary pupils, 11 of whom were unemployed laborers, who desired to improve their education during the winter season. All of these were day school pupils, but, besides, instruction was given in two classes of the industrial continuation school (*Fortbildungsschule*) connected with the *Fachschule*. These classes were held in the evenings and on Sundays, and boys only were received as pupils.

The term began October 15, 1890, and closed May 15, 1891. In the first year's course 52 apprentices were enrolled; in the second, 15. The teaching staff of this wood working school consists of the director and 5 assistants, 4 of whom are master workmen. Four additional teachers are employed as helpers, though not on the regular force. The subjects taught are special and industrial drawing for builders and cabinet-

makers, free-hand drawing, shades and projections, architectural drawing, wood turning, religion, geography, correspondence, business forms, arithmetic, bookkeeping, shop practice, etc.

Following are the statistical data of the first decade of the Bruck *Fachschule:*

ATTENDANCE AT THE BRUCK *FACHSCHULE*, 1881-1891.

Year.	Pupils.			Pupils in each trade.				
	Entering.	At end of year.	Graduated.	Joiners.	Pattern-makers.	Type-cutters.	Turners.	Carpenters.
1881-'82	8	8	.....	7	.....	1	.....	.....
1882-'83	17	17	.....	14	2	1	.....	.....
1883-'84	30	26	2	24	5	1	.....	.....
1884-'85	33	26	5	18	9	1	2	
1885-'86	28	22	6	15	8	.....	3	
1886-'87	20	20	4	13	.....	.....	3	
1887-'88	22	20	7	11	2	.....	4	
1888-'89	36	32	2	24	1	.....	5	
1889-'90	45	37	5	35	.....	.....	1	
1890-'91	34	30	4	26	.....	.....	1	

In the continuation classes of this school there were, besides, 10[illegible] pupils during the year 1890-'91.

Grätz is the seat of a flourishing state industrial school (*Kaiserlich-Königliche Staats-Gewerbeschule*). Herr Karl Laužil is director. With him are associated 13 professors, many of whom are eminent men. In the supplementary list are the names of 29 additional instructors, 4 of whom are female specialists in the art of embroidery.

There are four divisions of the school: A, the division of the building trades; B, the industrial art division; C, the public drawing and modelling school (for pupils of either sex); D, the industrial continuation school (for apprentices and helpers in the building, machinist, and other industries).

During the school year 1890-'91 there were in all 812 pupils enrolled in this school, distributed as follows: Division A, 202; division B, 111; division C, 81; division D, 418.

The length of the course varies for the several specialties. In division A, for example, five winter sessions are requisite for completing the course for masons, practical builders, etc. For joiners and locksmiths the course in this division is of three years' duration. In division B the course for modellers is of four years' extent; for ceramic painting, three years; for the wood and metal industries, four years each; for white embroidery, two years; for color embroidery, three years. In division C there is no fixed term of study. In division D the course is for three years.

The course of instruction in the classes of division A for builders and masons lasts five years, and embraces the following studies: First year, German language, geography, accounts, geometry, geometrical drawing, elements of free-hand drawing, calligraphy; second year, German, business forms, accounts, natural science, geometry, projections, free-

hand drawing, calligraphy, the building art, architectural drawing; third year, German, business principles and commercial bookkeeping, shades and projections, architectural drawing, knowledge of building materials, building art (wood), architecture for stone masons, algebra, free-hand drawing from models, study of architectural forms, architectural drawing and modelling; fourth year, principles of the building art, rural architecture, study of architectural forms, architectural drawing, architecture (stone and iron), free-hand drawing, projections, street building and hydraulics, modelling, etc.; fifth year, architecture, mensuration, street construction and hydraulics, projections, free-hand drawing.

In division B there is a common *Fachschule* of industrial art, a *Fachschule* (with workshop) of pottery, and special schools of the wood and iron industries, with shops. The studies in this division are as thorough as in the preceding one, of which we have given the programme in detail.

In division C (the public drawing and modelling school for men and women) the instruction is specialized according to the needs and the previous attainments of the pupils. Modelling in wax and clay, the technics of painting, ceramics, etc., are the branches pursued.

Industrial and machine drawing, free-hand and geometrical drawing, commercial arithmetic, bookkeeping, and business usages are the chief subjects taught in division D to the evening and Sunday classes for apprentices and helpers.

There is a special three years' course in the *Fachschule* of embroidery, consisting of instruction in drawing, the study of patterns and materials, the technology of embroidery, from studies in the art of embroidery, pattern cutting, etc.

Those who have completed the course in the lower divisions of the school of artistic embroidery may pursue a practical working course in the establishment, in which they can exercise themselves in undertakings of greater difficulty, thereby rendering easy the transition from the school to practical life.

At Innsbruck is another state industrial school (*Kaiserlich-Königliche Staats-Gewerbeschule*), with which there is connected a *Fachschule* at Hall, in the Tyrol. The director is Herr Johann Deininger, with whom are associated 9 professors and 5 master workmen as instructors in the industrial school. Besides these, 3 master workmen act as teachers in the *Fachschule* at Hall.

There are six divisions of this industrial school: The building trades division; industrial art division; special course for makers of instruments of precision; drawing course for women and girls; industrial continuation school; public drawing school for men.

The Hall *Fachschule* has two divisions: For wood carving and joinery, with shops; and Sunday courses.

During the school year 1890–'91 there were 272 regular pupils in all departments of the school in the winter course, 163 in the summer course, and 72 guests (*Hospitanten*), *i. e.*, attendants of the continuation classes and the Sunday courses.

The organization of the Innsbruck Industrial School and its courses of instruction are almost identical with those of the Grätz school. The special course for makers of instruments of precision comprises three sections—one for makers of cutting instruments, one for makers of electrotechnical apparatus, and one for makers of the parts of clocks and watches.

A collection of models of wood carving, designed especially for use in furniture decoration, is a part of the equipment of this school. The list includes ninety-seven specimens of leaves, buds, flowers, and other ornamental designs.

The workshops for instruction in mechanic arts at Klagenfurth (constituting a *Fachschule für das Maschinengewerbe*) are intended to instruct the pupils of the higher real school in mechanics, and also to afford an opportunity for metal and wood workers to educate themselves in the fundamental principles of their specialties.

The course occupies three years. The school year 1890–'91 opened September 16. Twenty-seven new pupils entered the school at that time, who, with the 42 pupils of the preceding year, made up a class of 69 regular students at the beginning of the school year. The faculty consists of the director, 2 special teachers, 5 master workmen, and 6 professors giving theoretical instruction.

In the theoretical department are taught German and geography, natural history, physics and chemistry, electrical science, and bookkeeping. The director himself oversees the instruction in the shops, and teaches mechanics and technology. Free-hand and machine drawing, arithmetic and geometry, are taught by another; technology, calligraphy, etc., by a third. Machine construction, carpentry, the elements of the locksmith's trade, patternmaking, and smith work are practically taught by master workmen, one for each specialty.

A special course for locomotive firemen and engineers was instituted in 1889. The first term in this course opened in November 1890, and 24 pupils attended it. Sixteen attended the second course, which began in March 1891.

At Salzburg there is a state industrial school (*Kaiserlich-Königliche Staats-Gewerbeschule*), with a continuation school annex. The director is assisted by 20 associate professors and special teachers.

There are four departments of the school, comprising a building trades department, an industrial art department, a public drawing and modelling department, a department of female employments and free-hand drawing.

The statistics of attendance for the year 1890–'91 were as follows:

Department.	Pupils.	
	Winter.	Summer.
Building trades division	138	27
Industrial art division:		
Carving, modelling, etc	27	25
Drawing and textile work for adult women	42	35
Public drawing and modelling room	11	7
Continuation school	188	109
Total	406	203

At Triest there is an industrial school (*Kaiserlich-Königliche Staats-Gewerbeschule* or *Imperiale Reale Scuola Industriale*), which has five divisions: An advanced industrial school, which has a section of the building trades and a mechanical section, each with a four years' course; a master workmen's school, with a special school of the wood industry, a special school of the stone industry, and a special school of decorative painting; an evening and Sunday school, with a building trades section, an industrial art section, and a mechanical section, each with a three years' course; a general continuation school, with a two years' course; and a division of embroidery, with a three years' course, and lace making, with a one year's course.

The programme of this school is published in Italian and German, both languages being used in the class room.

The advanced industrial school (*höhere Gewerbeschule*) aims to impart the special knowledge necessary for the principal branches of the building and mechanical trades. The plan of studies includes arithmetic, geometry, physics, chemistry, drawing, etc. The tuition, payable in advance, is 7 florins ($2.39) per semester for citizens of Austria, and 20 florins ($6.82) for foreigners. Pupils must provide themselves with materials and instruments for drawing and writing, but the school supplies patterns and models.

The master workmen's division of the school (*Werkmeisterschule*) is intended for the education of intelligent craftsmen in the specialties of wood work, stone work, and painting. The section of wood work has furniture, turning, and wood carving shops. A special school (*Fachschule*) of the stone industry furnishes instruction in the art of sculpture, and there is a special school of decorative painting for pupils in that art. Instruction begins about the middle of September each year, and closes in the middle of July. The full course in wood work and sculpture occupies 8 semesters; in decorative painting, 5 semesters. Tuition in this division costs the Austrian pupil 5 florins ($1.71); the foreigner, 15 florins ($5.12).

The evening and Sunday school (*Abend- und Sonntagsschule*) is designed for apprentices and helpers in the building, industrial art, and mechanic trades. There are in this school the following special courses:

Special courses in the building trades for masons, architects, and carpenters, for stonecutters, for joiners, for locksmiths; special course in the industrial arts for sculptors and modellers, for furniture makers and cabinetmakers, for artistic locksmiths, lithographers, and decorative painters; special course in the mechanical industries for machinists, for mechanics and watchmakers. The instruction in each of these courses continues three years. At least ten hours a week are required for instruction throughout the course. On Sundays from 8 a. m. to 12 m.; and for three days in the week, from 6.30 to 8.30 p. m. Every pupil pays an admission fee of 1 florin (34 cents) each year, and this sum is applied to the increase of the school appliances. Certificates of attendance are given at the end of the year, and at the close of a three years' course a leaving certificate (*Abgangs-Zeugniss*), as it is awkwardly styled, is granted to each pupil.

The evening continuation school (*allgemeine gewerbliche Fortbildungsschule*) is a school of a more general character than the preceding. It gives a two years' course of instruction, and serves as a feeder to the other departments of the institution.

The last division has two sections, a special school of lace making (*Fachschule für Spitzenarbeiten*), with a one year's course; and an embroidery school (*Fachschule für Kunststickerei*), with a two or three years' course. There are daily sessions of these schools on all week days, from 9 to 4 in winter, and in summer from 9 to 5 o'clock. Instruction is also given in the several specialties every Sunday from 9 to 12. The conditions of admission are that the pupil must be 14 years old, must bring a certificate from the public school (*Volksschule*), must possess some skill in lace making, in plain embroidery, and in drawing. The tuition is 2 florins (68 cents) per half year for regular pupils; for guests, 5 florins ($1.71); for foreign students, 15 florins ($5.12).

The general studies, pursued to a greater or less extent in all divisions of the school, include the Italian and German languages, geography, physics, chemistry, algebra, geometry, free-hand and geometrical drawing, topography, penmanship, mechanics, architectural drawing, mensuration, hydraulics, bookkeeping, and technology.

The Technological Industrial Museum of Vienna (*Kaiserlich-Königliche Technologisches Gewerbe-Museum*) was opened in 1879. On October 26, 1889, it completed the first decade of its existence. This museum was founded by the Industrial Society of Lower Austria on the model of the *Conservatoire des Arts et Métiers* in Paris. The project had been under consideration for several years. Many financial difficulties were encountered, but at last, in March 1879, it was decided to make a beginning by establishing a section for wood industries, leaving the further development of the scheme for a museum to be accomplished at a later period, according to the needs and possibilities that might appear.

Without following out the details of its growth, the statistics of attendance for the decade may be cited here:

Year.	Pupils.	Year.	Pupils.
1879–'80	44	1884–'85	228
1880–'81	90	1885–'86	309
1881–'82	92	1886–'87	310
1882–'83	109	1887–'88	353
1883–'84	224	1888–'89	406

The director of the Vienna Museum is Herr W. F. Exner. In the section of wood industry there are three professors, an assistant, and a master workman on the teaching staff. In the chemical section there are four professors, an assistant, and a master workman. In the section of metal industries and electrotechnics are a professor, an adjunct professor, an assistant, three master workmen, and two special teachers. There is also a brewing section, called the Austrian Experiment Station for Brewing and Malting (*Oesterreichische Versuchsstation für Brauerei und Mälzerei*). At the head of this section is a professor, with two adjunct professors, an assistant, a superintendent of machinery, an engineer, etc.

Standing committees and societies connected with the museum do much to promote the success of the several sections. Twelve such organizations are reported. Through their agency laboratories have been opened in the museum for experimental work in paper manufacture; in the chemistry of dyeing; in rendering wood fireproof by saturation with non-inflammable materials; in the composition of asphalt; in making matches non-poisonous, etc.; in discovering new means of disinfection, new explosives, etc.

There is, besides, a special course of instruction with evening and Sunday classes. In this section the teaching is conducted by means of lectures for the most part. The subjects discussed have a direct bearing upon practical industries. For example, the mechanical and chemical technology of wood and metals, the most important building woods, industrial hygiene, workshop equipment, etc., were among the topics of the year 1889–'90.

In the electrotechnic section instruction is given on batteries and accumulators, the telegraph, telephone, electric clocks, dynamo-electrical machines, etc. Technical drawing for joiners and cabinetmakers, and for machinists and locksmiths, is taught in special evening and Sunday courses. So, also, instruction is given in commercial bookkeeping, industrial computations, and the system of calculation for metal and wood work.

The programme of the special schools of the museum for the school year 1891–'92 indicates that a new course has been added under the title of school of the chemistry of dyeing (*Seminar für Tinctorial-Chemie*). The design of this section is to ground pupils in a knowl-

edge of general chemistry, of the manipulations of qualitative and quantitative analysis, and to train them by experimental work in the laboratory for independent research in their special callings, as chemists of dyes, colorists, master dyers, etc.

At Villach there is a special school of wood industries (*Kaiserlich-Königliche Fachschule für Holzindustrie*).

The school year 1890-'91—the nineteenth since the establishment of the institution—began, in accordance with the announcement of the programme, September 16, 1890, and closed July 31, 1891. The industrial and mercantile continuation schools (connected with the *Fachschule*) and the course in stenography opened October 5, 1890, and continued until the end of May 1891.

The *Fachschule*, in the strict sense of the term, is a day school, taught by the director and ten associate teachers. The continuation department is an evening school, with twelve instructors, four of whom are also teachers in the day department.

A two years' preparatory course was arranged for the opening of the school year 1891-'92, and it probably went into effect at that date. The regular course in the *Fachschule* lasts four years.

In this school there is a section of drawing and modelling for men; a similar section for women; one for pupils of the *Volksschule;* a section for evening instruction (two years' course in this industrial continuation school); a mercantile continuation course of like duration; and a course of stenography.

In the preparatory course reading, writing, accounts, and drawing occupy the first year; special courses in drawing (building, technical, industrial, mechanical), commercial accounts, commercial bookkeeping, and modelling occupy the second year.

In the day school of wood work there are subdivisions for cabinet-making, joinery, wood carving, and wood turning. In each of these specialties the course lasts four years. The conditions of admission are that the pupil must have completed the *Volksschule* studies and possesses sufficient bodily strength to pursue the course profitably.

Free-hand and geometrical drawing, shades and projections, drawing from models, architectural form study, drawing for furniture makers and joiners, carvers, and turners, modelling, arithmetic, geometry, language and business usages, commercial bookkeeping, the elements of the technology of wood, finishing and practical instruction in furniture making, joinery, wood carving, and wood turning are the subjects taken up in the regular *Fachschule.*

The industrial continuation school gives to apprentices special theoretical and, as far as practicable, actual shop work instruction in each industrial art specialty and technical or commercial pursuit which is needed in the exercise of their respective callings. Attendance upon this instruction is obligatory for all apprentices.

The mercantile continuation course aims to teach apprentices to trades

those technical and commercial specialties which are of importance in the business of a merchant. The subjects taught are the German language, trade geography, arithmetic, and penmanship in the first year; in the second year course, correspondence, accounts, bookkeeping, knowledge of goods, mercantile accounts, and the laws of trade and of business. The courses in drawing and stenography are of indefinite duration. The enrolment in all departments for the school year 1890–'91 was 400. These were distributed as follows: Day school, 50; public drawing school (women), 16; public drawing and modelling school (men), 30; drawing and modelling pupils (*Volksschule*), 98; preparatory division, 44; industrial continuation school, 126; mercantile continuation school, 28; stenographers' course, 8.

Of the 73 day school pupils who have finished the course of instruction at this establishment since 1877 (inclusive of those graduated in the year of the report) 2 are dead, 65 remain in the occupation learned in the school, and 6 have made choice of a different life work.

The subjoined particulars afford a general idea of the station in life of the 65 graduates:

OCCUPATIONS OF GRADUATES.

Occupation.	Graduates.	Occupation.	Graduates.
Designers	2	Independent master workmen:	
Director of manufacturing establishment	1	Carpenters	3
Foremen:		Joiners	4
Joiners	2	Furniture makers	6
Masons	2	Masons	9
Helpers:		Students:	
Joiners	12	Vienna Art Industrial School	3
Masons	8	Vienna Technological Museum	2
Turners	2	Teachers, industrial *Fachschulen*	4
In military service	5		
		Total	65

The data for the foregoing summary were obtained by means of circular letters from the school, in which the graduates were solicited to state their position in life, their income, and give their conclusions concerning such things, noting whether they were satisfied with their situation, and what influence the training of the *Fachschule* had exercised upon them and their condition.

It is to be regretted that there is not space to reproduce a part of the highly interesting answers, even in an abbreviated form. In general, it may be said that the most of the pupils are content with their condition in life; that some of them have, after severe struggles, attained to a favorable position; and that finally all, without exception, recognize the value of the *Fachschule* training, and sometimes give expression to their gratitude for it in an extravagant fashion.

The best situation held by one of the former pupils is that of director of a pottery manufactory at Bonn. The salary attached to the position is 3,000 marks ($714), in addition to which he receives other fees amount-

ing to 1,000 or 1,500 marks ($238 or $357). Then come the teachers in the *Fachschule.* The lowest wages are reported by a pupil who went to work at Grätz at 6 florins ($2.05) a week. Between these extremes there lie very many grades, which are partly dependent upon local conditions. Higher salaries are paid abroad than at home. At Munich a joiner receives from 3 to 5 marks (71 cents to $1.19) a day; a cabinetmaker, 21 marks ($5) a week; a mason, 28 to 30 marks ($6.66 to $7.14) a week. Most pupils give 2 to 4 florins (68 cents to $1.36) a day as the amount of their income. In Austria helpers report their monthly incomes at 24 florins, 32 florins, 40 florins, and 50 florins ($8.18, $10.91, $13.64, and $17.05); master workmen and foremen, 48 florins to 70 florins ($16.37 to $23.87) a week.

The commercial schools (*Handelsschulen*) of Budapesth are organized on a plan similar to that of other commercial schools of Austria, but with certain differences. Under the law of the people's schools a boy can not be apprenticed until he has attained his twelfth year and passed through the sixth class of the elementary school. From the elementary school the pupil passes to the lower grade of the commercial school, attendance in which is obligatory. These schools have a three years' course, with seven hours of study per week. The students are for the most part clerks and apprentices in mercantile business.

In the lower commercial schools the course includes reading, mercantile arithmetic, bookkeeping, correspondence, a knowledge of salable goods, national economy, etc.

The higher commercial schools approach more nearly to the character of special schools. Yet, besides commercial specialties, they make provision for teaching various branches of general knowledge.

Pupils are admitted to these schools at the age of 14. The first year's course consists of instruction in the Hungarian, German, and French languages, geography, history, mathematics, chemistry, technology, physics, commercial arithmetic, business methods, correspondence, and accounts; altogether, thirty hours a week. In the second and third years the same subjects are continued, with the addition of bookkeeping, the laws of trade, national economy, and finance; thirty hours per week during the second year and twenty-six hours during the third. The optional studies are English and Oriental languages, the applications of chemistry, etc.

In the year 1888–'89 there were three commercial schools of the lower grade in the city, with an enrolment of 419 pupils altogether. Of this number 356 remained in the schools at the end of the year. In the three higher or intermediate commercial schools 466 pupils were enrolled, of whom 413 remained at the close of the year.

Such is the record of the commercial schools in Budapesth as reported in the *Statistik des Unterrichtswesens* for 1885–1889. It does not appear that manual exercises and workshop practice have any place in the course of instruction, except to this extent, viz., that

drawing and modelling are made obligatory. The schools give no indication of being specially adapted to qualify students for any particular trade. They apparently aim simply to give a thorough general business education.

An obscurity exists in the statistical report concerning the trade schools of the city of Prague. In this case the calling for which students are prepared in the several schools is carefully noted; but nothing is said of any auxiliary educational discipline. The special schools of industry and trade in the city of Prague are catalogued as follows, with the number of teachers and pupils for the year 1888:

INDUSTRIAL SCHOOLS OF THE CITY OF PRAGUE.

School.	Teachers.	Pupils.	School.	Teachers.	Pupils.
Bakers	2	97	Shoemakers	8	365
Barbers	3	107	Tailors	5	221
Bookbinders	3	155	Typographers	6	141
Butchers	2	99	Varnishers	5	111
Carpenters	1	57	Waiters	2	63
Confectioners	1	45	Other trades	1	63
Coopers	1	35	Preparatory school	3	185
Glovers	4	159	Continuation school	9	267
Goldsmiths	12	539			
Locksmiths	1	55	Total	76	3,001
Merchants	7	237			

There is also a city continuation school for girls, with 7 teachers and 191 pupils. A school for beer brewing, with 6 teachers and 37 pupils, and a school of instruction in the manufacture of spirits, with 5 teachers and 10 pupils, are maintained; and the unions of working women support 41 classes, in which 47 teachers are employed, and which are attended by 1,147 pupils. In addition to these there are 10 classes, with 516 students, taught by 15 teachers, in the special mercantile school.

Besides there are two mercantile academies, one for Bohemians and the other for Germans, in Prague. In the first there were, in 1888, 12 teachers and 188 pupils; in the German academy, at the same date, there were 16 instructors and 333 pupils. The name given to these institutions implies that some form of business education is carried on in them, but no explanation of its nature or extent is afforded for the satisfaction of piqued curiosity.

Of the various private schools in Prague there is little to report. There are, however, two industrial schools under private management in the city, with 2 teachers and 58 pupils; seven schools for teaching dressmaking, with 7 teachers and 47 pupils; four trade schools, with 27 teachers and 300 pupils; and a school of telegraphy, with 2 teachers and 40 pupils. But in no case is the length of the course, the programme of studies, or the cost of tuition stated.

Prague has an industrial museum, freely open to the public, in which there is a rich collection of specimens in 15 different departments.

The Academy of Commerce at Prague was opened in 1856. Like most institutions of this class, this school has a three years' course of study. The age of entrance is 14. The government grants a subvention to this school, and exempts its graduates from two years' military service.

Other schools of a similar grade exist at Vienna, Pest, Grätz, and Lintz.

In Austria there are 302 establishments that give instruction in commerce to 6,000 regular students and to nearly 40,000 clerks and apprentices.

CHAPTER III.

PRESENT STATUS OF INDUSTRIAL EDUCATION IN BELGIUM.

CHAPTER III.

PRESENT STATUS OF INDUSTRIAL EDUCATION IN BELGIUM.

THE PUBLIC SCHOOL SYSTEM.

Public education in Belgium, dating back to 1842, was organized as it now exists under the law of July 1, 1879, and is controlled by the ministry of the interior and public instruction. It comprises—

I. Primary education.
II. Intermediate education.
III. Higher education.

I.—Primary education embraces—

(*a*) The kindergartens (*écoles gardiens* or *jardins d'enfants*) which, by the last official report (*Annuaire Statistique de la Belgique*, 1890), number 1,042 schools and 104,760 pupils.

(*b*) Primary schools, 5,614 in number attended by 614,671 pupils.

(*c*) Special classes for adults corresponding to our night schools; and, besides, all instruction provided for inmates of asylums for deaf mutes, and for inmates of prisons and reformatories.

(*d*) Primary normal classes, normal-schools, and schools for regents—a grade above the normal.

(*e*) Private schools under state inspection.

II.—Intermediate education includes—

(*a*) Intermediate schools of three divisions, state, communal or district schools, and private and sectarian schools which are inspected and sometimes subsidized by the government.

(*b*) High schools (*athénées royaux*) and communal and sectarian colleges, also inspected and partly supported by the state.

III.—Higher education is represented by the two state universities at Ghent and Liege, and the two free universities at Brussels and Louvain—free in the sense of not being state institutions.

Under this heading also may be comprehended special examinations for degrees before the university faculties and central board.

KINDERGARTENS.

The direct relation of the kindergarten to manual training and to trade schools is being earnestly studied and experimented with in Belgium.

Everywhere the kindergarten forms a large, important, and well organized part of the public school system, and in several cities a

woman inspector devotes her whole time to the improvement of these infant schools and to the proper training of teachers to preside over them.

Children enter the kindergartens at 3 years of age and remain till they are 6 or 7. At Brussels, Liege, and Verviers, experimental transition classes exist, which prolong kindergarten methods into the primary grades, the manual training exercises of Froebel reappearing in the primary schools and there developing into some simple form of actual hand labor with paper, pasteboard, or clay. The results have been very satisfactory.

In the city of Liege there were, according to the report of 1891 (*Rapport sur l'Administration et la Situation des Affaires de la Ville*), 4,717 children in attendance at the kindergarten. All of these children, of course, learn the alphabet of manual training.

A normal course for kindergarten teachers (*Cours normal de la méthode Froebel*) is also maintained in Liege. During the school year 1890–'91, 18 pupil teachers attended this course, and 5 took the final examination and received diplomas in that year.

This Department has received from one of the Liege kindergartens (*Jardin d'Enfants des Près Saint Denis*) an album filled with specimens of paper work executed by pupils of that school. These specimens consist of artistic designs wrought in colored paper, and the interwoven figures make patterns that are most pleasing to the eye. Such work affords an excellent discipline in form study and in the combination of colors.

MANUAL TRAINING FOR GIRLS IN THE PRIMARY SCHOOLS.

Sewing, drawing, and gymnastics have long been taught to some extent in various Belgian schools. In 1887, however, the director of primary education, Monsieur A. J. Germain, was charged to report to the ministry on the advisability of incorporating throughout all the primary and normal schools of the kingdom, classes in domestic work and housekeeping. One result of this valuable report (*De l'Enseignement des Travaux du Ménage*) was the improvement and extension to all the schools of those sewing classes previously existing only in a few; and a no less important consequence was the adaptation to the public school system of courses in cooking and dressmaking which had already proved successful and useful in institutions founded and supported by private effort. Trade instruction for girls, started by private initiative, having taken firm root and flourished in Brussels and other Belgian cities, the idea was adopted by the more progressive communes and was applied in their primary or intermediate schools in the form of trade classes (*cours professionnels*). Tried as an experiment at a few points only, it was found too expensive to attempt to give such specialized industrial training to the whole school population; but the num-

ber of centres where trade instruction is provided in connection with the free schools is constantly increasing.

The oldest and best of these trade classes engrafted on the communal public school was established in 1886 at Saint-Josse-Ten-Noode, Brussels, by Monsieur H. Frick, the alderman of public instruction. In the girl's primary school, rue de la Limite, lessons in plain sewing, dressmaking, cutting and fitting, and pattern draughting are given. The course covers three years, and arouses much interest. It is entirely gratuitous. The school day is divided into two equal parts. During the morning, pupils follow the complete primary studies; during the afternoon, they learn special trades, electing either commerce and bookkeeping, or dressmaking, including cutting and fitting, or underwear making. Industrial drawing is an important feature of each course. At the close of the third year the pupils pass an examination before teachers and technical judges (*gens de métier*), and then readily find employment in work rooms or commercial houses.

In connection with the higher divisions of the primary schools in Verviers, classes in domestic economy and housekeeping have been opened, which complete the prescribed course in one year. They comprise cooking, washing and ironing, household economy, how to make a fire and manage it economically, ventilation, the uses of various kinds of fuel, precautions to be taken in the use of combustibles, means employed for illumination, precautions requisite in certain modes of lighting, household and personal hygiene, classification of foods, their nutritive value and medicinal properties; potatoes of different species, relative price of the various kinds, nutritive principles of, industrial use of, etc.; bread, varieties of, nutritive value of; meat (beef, pork, veal, mutton, etc.), uses of different parts in culinary preparations; meals, ordinary, for a workman's family of six persons; for a spread for a workman's family of twelve persons; bills of fare for a middle class family of six persons; the purchasing of provisions, counsel as to buying to advantage for winter use; drinks—water, milk, beer, coffee, tea, chocolate; pernicious effects of alcoholic liquors; condiments, preserves; table service; household medicine; furniture; accounts; plant culture, etc.

MANUAL TRAINING FOR GIRLS IN THE INTERMEDIATE SCHOOLS.

So great was the success of the free classes in the primary schools at Brussels that, on the demand of patrons, this identical type of instruction, but more advanced, has been adapted to the intermediate school of the same commune, rue Musin, under the capable direction of Mademoiselle Destrée. Here a small fee is charged for the special courses, remitted, however, as a reward to the brighter pupils from the trade classes of the primary school who wish to profit further by industrial training. The mornings are devoted to the usual intermediate branches, and in the afternoons the industrial pupils pursue whatever trade

course they may have elected. The number of special courses is larger in this school than in that of lower grade, and painting on porcelain is carried to great perfection.

The difference between the book work done in the ordinary intermediate grades and that covered by the trade classes in the same years is shown by the following table:

COURSE OF STUDY IN THE INTERMEDIATE SCHOOLS.

Subject.	Hours per week.						Commercial course, first year.
	Intermediate course.			Industrial course.			
	First year.	Second year.	Third year.	First year.	Second year.	Third year.	
Bookkeeping	.....	1	1½	.....	1	1½	4
Drawing	2	2	2	2	2	2	2
English	1	3	2	1	3	2	3
Flemish	5½	4	3½	5	3½	3½	2½
French	6	6	5	5½	4	5	4
Geography	2	2	2½	1	1	1	1
German	3	2½	3	3	2½	3	1
Gymnastics	2	2	1½	2	1½	1½	.....
History	2½	2½	2½	1	1	1	.....
Industry	2	2	2	10	10	10	2
Mathematics	4	4	4	4	4	4	2
Painting and drawing	12	12	.....	12	12	.....	.....
Science	2	2	2	1	1	1	.....
Total	44	45	31½	47½	46½	35½	21½

In the first year the industrial pupils give but one hour a week each to science, history, and geography, while the regular intermediate classes give, respectively, two, two and a half, and two hours. The industrial pupils devote ten hours to trade instruction, while the intermediate pupils devote only two hours to sewing. The time for drawing is largely increased, that for languages is diminished, in the second and third years.

At Molenbeek commune, Brussels, a trade school similar in character has been added to a public school already containing a kindergarten and a *crèche*. At Ixelles, another commune of the capital, thorough and practical trade courses have been in operation three years, and cooking has also been introduced by means of a cookery centre similar to the English central stations for the use of classes from many schools. This cookery centre has grown to its present importance from a small housekeeping school first established by a committee of ladies interested in giving domestic training to the children of the people. The Countess of Flanders is president of this society, through whose efforts housekeeping schools have been opened in various parts of the kingdom.

Beginning at Ixelles, with six workingmen's daughters as pupils and an old *concierge* of the building as cooking teacher, this housekeeping school now employs a directress and three assistants. Several hundred girls, coming in classes of twelve from adjoining public schools during stated hours weekly, receive instruction. Other classes attend from a *neighboring convent*, and Thursdays are set apart for young girls who

wish to remain all day. These are usually little housekeepers in charge of the homes of absent workers. The course will be more fully described under housekeeping schools for girls, but in a general way it may be said to comprise cooking, cleaning, washing and ironing, mending, darning, marketing, keeping accounts, writing out receipts, and describing methods and domestic economy and hygiene.

MANUAL TRAINING FOR GIRLS IN NORMAL SCHOOLS.

In other communes of Brussels and in other cities of the kingdom the grafting of trade and housekeeping courses on the public school system is proceeding so rapidly that teachers to conduct these industrial classes in a scientific way are not numerous enough. Candidates are therefore being trained in special normal classes, and industrial instruction now forms a part of the curricula of all the normal schools.

COURSE OF STUDY IN NORMAL SCHOOLS.

Subject.	Hours per week.		
	First year.	Second year.	Third year.
Religion and morals	2	2	2
Precepts of morals and ethics	1	1	1
Elements of the theory of constitutional government	.....	.....	1
Pedagogy and method	1	3	3
French language	5	5	5
A second language, obligatory	4	4	3
Arithmetic and geometrical forms	3	3	2
Geography	1	1	1
History	2	2	2
Natural science and domestic economy	2	2	1
Hygiene	.....	.....	1
Writing and bookkeeping	1	1	.....
Drawing	2	2	1
Vocal music	2	2	1
Gymnastics	2	2	1
Needlework	4	4	3

The directress of the Brussels Normal School, 22 rue des Visitandines, writes as follows:

The programme of domestic economy and housekeeping classes is perfectly practicable and has for years been followed in its entirety in my school. Young women have a natural aptitude for housekeeping pursuits and the apprenticeship need not be long. The theoretical part of this programme has always figured in our school work; the practical part is newer, and we take this up after regular hours in order not to interfere with other branches of instruction.

Thus, in the second year, on Thursdays, from 2 to 4 o'clock, laundry work is thoroughly taught, the pupils coming in groups and each group having a turn once a fortnight. In the third year, once a week from October to the end of May, from 4.30 to 7.30 o'clock in the afternoon, cooking lessons are given. All the class learns the chemistry of cooking, while the active group prepares the repast, cleans the utensils, dines with the teacher, and then puts everything in order. Each group is in active service once a month.

Thus conducted, domestic work does not encroach upon the scientific and literary courses, and has the happiest effect upon the dispositions of the girls, their tastes, and even their character.

Everywhere in Belgium drawing is a most important essential in public school instruction, both for girls and boys, and needlework occupies always two hours a week, the instruction in this branch being usually given by the regular teacher of the grade. In some schools more time is devoted to sewing. At Ostend girls continue to receive needlework training throughout the entire course. The work in this department is carried forward by a series of progressive lessons, and in the advanced grades the cutting and making of garments receive attention, with mending, darning, etc. Later in the course the elements of domestic economy are taken up.

MANUAL TRAINING FOR BOYS.

While industrial training for girls from the primary to the normal grades has thus been inaugurated, the boys have not been neglected. Belgium has always been quick to profit by new methods in use in other countries, and with a view to introducing manual training into the boys' public schools, in 1882 the minister of public instruction sent Prof. van Kalken to Dresden to take a course under Herr Clauson-Kaas. In 1883 Prof. van Kalken and M. Sluys, director of the Brussels Normal School for Males, were deputed to go to Sweden and study the system prevailing at Nääs.

Prof. van Kalken, in his address before the German manual training congress at Munich in 1888, says:

The defeat of the liberal party in 1884 interfered for a time with the execution of this plan, * * * but in 1885 M. Sluys was authorized (by the new minister) to introduce manual training, in accordance with our report of 1883. Since then the normal school pupils have regularly received instruction in modelling, pasteboard work, and wood work for four hours each week. The city of Brussels has also introduced some form of manual training into all of her primary schools.

In order to form a teaching force that shall be competent to impart this instruction, the city has instituted various temporary courses under the direction of M. Sluys, with the assistance of well qualified teachers. M. Calozet manages the pasteboard work, which is his specialty, at the normal school at Brussels and in several temporary courses. He has established a journal of manual training and has published a book entitled School Pasteboard Work, in which he describes his series of models. This series is somewhat like those of Leonard and Kummer of Dresden.

The commune of Saint-Gilles, Brussels, is entitled to the honor of having opened the first course for manual training in Belgium. Wood and pasteboard work were there taught. On October 1, 1885, there was begun a course of wood work for the upper class pupils of school No. 5, under the direction of M. van Sweevelt. In March 1886 Froebellian exercises were introduced into the lower grades and pasteboard work into the intermediate grades. * * * Up to the year 1887 the models of the normal school at Nääs had served as guides in wood work, because this series had a genuine pedagogic value. * * * Yet the Swedish models could not be slavishly followed in *Belgium, and it* was apparent that it would be necessary to prepare

an advanced series of models adapted to the national genius. M. van Sweevelt had begun in 1886 to execute this conception, and in the month of August 1887 he had formed a new series of 100 models of wood work.

* * * Minister Thonissen had great faith in manual training, and resolved to establish temporary courses for the teachers of the whole country. Accordingly, in September 1887, the first course of six weeks' instruction was opened at Nivelles, and in the corresponding month this year (1888) it will be repeated. After March 1889 the teachers will have to undergo an examination in hand labor before an examining commission appointed by the state. The course at Nivelles was attended by 60 teachers. M. van Sweevelt instructs in wood work, M. Calozet in pasteboard work, and M. Stepman in modelling. I am engaged to lecture on the following subjects:

(1) Analysis of the ideas of Locke, Rousseau, Froebel, and Biedermann concerning manual labor.

(2) The different systems now in vogue. Manual training wears a special character in France, Sweden, and Germany. Comparison of these systems.

(3) The true character of the work in the elementary school; what distinguishes it from the instruction of the artisan.

(4) Pasteboard work: Description of the Dresden series. Wood work: The Nääs series. This series, admirable for Sweden, is not altogether suitable for Belgium.

(5) Hand labor in connection with drawing and geometrical form teaching; working after a pattern; drawing of patterns; the making of an object from the drawing.

(6) Suggestions on beauty, harmony of colors, etc.

(7) Workshops, their equipment, the minimum number of tools requisite, materials, etc.

Since 1887 the state has made manual training obligatory in the state normal schools. All these institutions have received a full set of working tools for modelling, pasteboard work, and wood work. About fifty communes, also, have introduced this instruction into their schools.

To recapitulate:

The number of manual training schools: All state normal schools; about fifty primary schools.

Subjects of instruction: Pasteboard work, modelling, and wood work obligatory in state normal schools; elective in primary schools.

Assistance given by the state: Temporary courses established by government; special examinations before an official examining commission; the introduction of manual labor into all state schools.

As to teachers, there are two parties; some are adherents, and a smaller number are opponents, of the new system.

Public opinion: All journals, Catholic as well as liberal, favor the movement, but artisans are in general inimical to this instruction.

Manual training teachers: The instruction in hand labor will be given everywhere by special teachers.

From 1888 to 1892 brilliant results have been achieved in the multiplication of these manual training classes all over the kingdom.

In Liege, at the primary school rue des Rivagois, encouraging results have been obtained in modelling, pasteboard and wood work. The city opened, besides, a special course for teachers lasting nine weeks, held from 5 to 8 p. m., and attended by thirty teachers. In

the intermediate schools of Liege classes in domestic economy and housekeeping have been created. An interesting variation of these is to be seen in four cooking courses opened in connection with as many night schools in central localities.

At one night school visited by an agent of this Department over 100 pupils were present, nearly all of whom were workers in shops—tailoresses, vestmakers, dressmakers, the remainder, as a rule, being housekeepers for the workers of their families. Twice a week cooking lessons, theory and practice, are given. The kitchen equipped by the city is altogether in white, so as to inculcate extreme neatness. The city, moreover, furnishes all materials used in the cookery demonstrations. The needlework course comprises cutting and fitting, and careful drawing of patterns, while the general literary course is that of the intermediate grade condensed. Prizes are awarded by the city to the six pupils who stand highest, this reward taking the form usually of a little free summer journey, on which the winners are escorted by a teacher. In 1889 the successful scholars were sent in this way to the Paris exposition for several days, with ample opportunity for observation and enjoyment.

At Verviers wood work classes for boys have proved highly successful, and the objects made, both by the sloid method and by the adapted methods devised by Belgian teachers, equal in finish and scientific gradations the best work done in American schools. The city has also created carpentry centres, classes from several neighboring public schools frequenting the one shop, which was fitted up at remarkably small cost, considering its excellent appointments.

SPECIAL, INDUSTRIAL, AND TECHNICAL SCHOOLS.

That portion of industrial education in Belgium with which this report more particularly deals—the special, industrial, and technical schools—falls under the supervision, not of the ministry of the interior and of public instruction, but of the ministry of agriculture, industry, and public works.

By an agreement made in 1889 the ministry of public instruction controls all theoretical teaching of hygiene and domestic economy in the primary and night schools, all manual training and needlework classes, and certain normal courses and object lessons. The ministry of agriculture, industry, and public works supervises technical and trade schools, organizes the housekeeping schools proper (*écoles ménagères*), and all trade and domestic training classes in the public schools. In addition it has for years carried on the great work of developing, subsidizing, and inspecting the large drawing schools, industrial schools, apprentice and agricultural schools.

To this ministry of agriculture, industry, and public works belongs the duty of inspecting workshops and enforcing factory laws. Being thus intimately connected with the industries of the kingdom and

brought into contact with its industrial needs, by an easy transition the oversight of technical and industrial education in all its phases was confided to this ministry, and a complete service of inspection was established, both of industry and of trade instruction. Since 1891 the organization and inspection of all the housekeeping schools grafted on the public school system, as well as of independent institutions for domestic training and trade instruction, have been turned over to the same department, and the official force of inspectors includes both women and men.

The fact that the state organizes and aids public instruction, that there is one enlightened head, one policy, one system of inspection with a very high standard, instead of many independent superintendents with different policies, conduces not a little to the excellence and practical utility of industrial teaching in this progressive nation. At the same time full play is afforded for private munificence, initiative, and experiment. Every man's system is given a fair trial, his pet ideas free scope. The government merely strengthens where private hands are weak, guides where they are inexperienced, supplies omissions, and supervises firmly but not offensively.

Special, industrial, and technical instruction in Belgium may be classified as follows:

I. Apprenticeship schools and *ouvroirs*, or workshop and school combined. These were established as charities, and are diminishing in number and importance.

II. Agricultural and horticultural schools, and schools for training dairy maids.

III. Girls' housekeeping schools, rapidly developing, over 250 having already been established.

IV. Trade schools for girls, of which all the principal cities now boast one or more.

V. Parochial trade schools, those of Saint Luke being the highest type.

VI. Trade schools supported by guilds and trade unions, such as the brewers' and tailors' schools.

VII. Trade schools having day classes and shop work. Their design is to fit for a trade and to do away with the often misdirected drudgery of apprenticeship.

VIII. Large industrial schools, sometimes combined with drawing schools, sometimes separate, where classes are held in the evenings and on Sundays and where the course is widely eclectic.

IX. Drawing schools, existing in every town of any size in the kingdom.

X. Commercial schools, the most important of which is at Antwerp, with the object to prepare accountants, merchants, consular and commercial agents for home and consular service.

XI. Schools of industry and mines, highly scientific in character.

These confer the much esteemed degree of engineer, and correspond in a measure to our institutes of technology. The new Technical Institute of Electricity given by M. Montefiore-Levi to the city of Liege ranks in this category.

The aim of technical and industrial schools in Belgium is trade proficiency rather than all-around education. They are designed to train the artisan rather than to develop the man. Apprentices, workingmen, and would-be workers awaiting employment attend these industrial courses to increase their own technical efficiency in the trades they are already following or mean to adopt, and also with the hope of improving their chance of obtaining better occupation at those pursuits in a labor market seriously overcrowded. Although joint instruction, mental and manual, is generally provided, the mental is usually sacrificed or at least subordinated to the manual; and it is intended not so much to add to the pupil's sum of knowledge in all lines as to aid and develop his capacity in his present or future calling. Considered as mere trade schools, it is their strong point that time is not lost in acquiring facts which have no bearing on the life work. Considered as educational factors, however, these great industrial institutions are sometimes called narrow and one sided. In their favor the fact should be emphasized that a great variety of teaching in all branches is offered, courses as purely theoretical and scientific as American colleges afford. The workingman or student in any walk of life who chooses to attend night school during six, eight, even ten years—and some men study twelve and fifteen years—gets a very comprehensive literary and scientific as well as industrial course. Degrees are given, however, after three and four years for proficiency in any one branch or course, and the majority of pupils frequent the school no longer after winning the certificate they set out to gain. A great many young men, many men of mature years, indeed, take course after course, and degree after degree, after having succeeded in mastering the branch which will best serve in their chosen occupation or life work—an occupation seldom changed in the stable and conservative social order and traditions which distinguish the Belgian people.

In many provinces the age of admission to industrial schools of the higher grade is 12 and 13 years, and the course of instruction is meant to make up to the pupil workman for his lack of further public school tuition. Institutions of the most advanced standards he enters at 15 or 16, and the book work he accomplishes is always less than that prescribed in public schools of similar grades, for drawing and practical applications take up much time.

The money to support the industrial, art, trade, and special schools in Belgium is derived from various sources. The government subsidizes nearly all these institutions freely, thus acquiring the right to inspect them, and also, to a limited degree, to impose special lines of study or curtail others. The communes or counties, besides, contribute funds,

and usually the city as well, sometimes more liberally than the others. In some towns the educational institutions, of whatever kind they may be, are maintained wholly by certain districts (communes); and these communes, instead of duplicating by means of poorly equipped schools in their own midst the great central or special schools, wisely content themselves with giving scholarships in the latter to deserving students. Molenbeek and Saint-Josse-Ten-Noode at Brussels boast that no boy or girl within their limits need go without the best special training the kingdom affords, the commune bearing the pupil's expenses while in attendance at the university or art and trade classes not provided by the commune itself. In Liege, in Verviers, in Brussels, the municipality assists even the most heterogeneous educational ventures, giving a room or building, furnishing teachers, supplying books and materials to be used by the cooking and sewing classes, and even aiding an enterprise not entirely educational, like the working girls' clubs, to which Brussels presents a vacation purse of 500 francs ($96.50).

A remarkable feature of Belgian industrial education and worthy of all emulation is that many firms and industrial establishments, impressed with the need of having better trained workmen, and actuated by motives of genuine philanthropy, create and support technical and special schools. The large and admirably managed industrial school at Morlanwelz was founded and is partly maintained by M. Arthur Warocqué, owner of the neighboring mines of Mariemont and Bascoup. The course of study comprises general branches useful to all workers and, in addition, special instruction bearing on mines and mining. At Seraing the great Cockerill iron works, spending nearly 200,000 francs ($38,600) a year in advancing the welfare of its operatives by means of hospitals, societies, and pensions, also supports in great part, without monopolizing, the flourishing Seraing industrial school. The company is, moreover, making a unique experiment—that of teaching the young boys over 12 years of age employed in their coal mines, so that they may not forget the instruction gained in the primary schools. The lads stop work at 4 p. m. and go at once to the school for two or three hours, learning enough to keep their minds active and thus counteract the stultifying effects of their toil. This same firm maintains at Hoboken, near Antwerp, an important industrial school, modified to the requirements of the ship building trade pursued in their shops (*chantiers*) at Hoboken. The faience manufacturers at La Louvière have organized a special drawing school which all of their decorators must attend. Indeed, every technical and industrial educational establishment in the kingdom is aided financially by the large firms and employers of labor whose workmen are enrolled as students.

A striking characteristic of industrial training in Belgium is its adaptability to local needs. For example, the industrial school at Soignies, where the chief industry is stone quarrying, strikes out of its curriculum much irrelevant matter that may with propriety be taught in other

industrial schools, such as Brussels, which aim to fit men for a dozen vocations. Soignies, on the contrary, directs its efforts to studies that will be useful to quarrymen, stonecutters, and even stone carvers, the artistic side never being neglected in this land of wonderful ancient architectural monuments. At Ostend, where the fisheries are the predominating industry, a class in fishery has been successfully carried on by a priest, and a special room has been arranged in the public schools as a fisheries museum or workshop, containing all the appliances used in this trade. To this room are brought daily all the sons of fishermen among the 500 pupils in the building, and these boys, probably destined to a life on the Channel and the North Sea, learn what pertains to that pursuit. The geography of the district is taught by means of ocean and land charts, the use of the compass, the manœuvres of fishermen, the tying of knots and the setting of sails, the forms of sailing boats, the kinds and habits of fish, etc. Of course, the ordinary book work of the grade had to be lessened to make room for this special class. As yet the course is only tentative and applied to boys under 12 years of age, but such interest does it awaken and so successful has it been that the intention is to continue this instruction into the higher grades. Moreover, the large and important industrial school at Ostend is more developed than any other in all teaching which pertains to ship building. Even in the lowest drawing classes the instruction is directed toward that trade. Instead of drawing ordinary machines the pupils draw boats, and though the institution is poorly housed on one of the worst streets of Ostend, it possesses a collection of models and ships that any museum might be proud to own.

At Ghent, too, where cotton and linen are manufactured the teaching in the industrial school conforms to the needs of local industries, and a finely equipped weaving school is maintained, with day and Sunday courses. Each pupil begins with the simplest form of hand loom and learns every process up to the management of the most complicated modern power loom. The combination and analysis of warp and woof in fabrics is studied thoroughly, and those who finish the lessons marked out are fully capable of conducting the business of cotton manufacturing for themselves, or of taking charge of any weaving room and of reproducing any sample. Candidates who wish to master the art of dyeing, with reference to print works and designing, pursue an elaborate chemical course. The sketching of textile machinery, setting it up, and taking it apart are important exercises for such as are or intend to be loom fixers and mill machinists. Nor are women operatives forgotten, special Sunday and evening lessons being provided for darners and burlers, which are shared by tailoresses and dressmakers as well.

What is true of Ghent applies with equal force to Verviers, the classes there being adapted to the woollen industry, and special instruction is carried very far. At Charleroi, with its network of coal seams, *the instruction* is suited to miners, with technical teaching for those

who work underground. These student workmen walk 5 and 6 miles and back to the Sunday classes; and so indispensable is the training deemed that men have little chance to become boss miners or foremen without holding certificates from the industrial school.

The eclectic character of industrial training in Belgium is another inestimable advantage. For instance, the Flemish peasant, long past his school days and toiling seven days in the week for the necessities of life, may double his opportunities and advance his career by learning French thoroughly in the night classes of the industrial school of his commune. Another gets aid at drawing, mechanics, whatever branch he most needs, without wasting time on non-essentials. The tradesman acquires bookkeeping and commerce, the designer takes an elaborate course of free-hand drawing and modelling, the machinist draws to scale or reproduces machinery in time sketches.

The practice, common to trade and manual training institutions in Belgium, of paying the pupil low market rates for the work accomplished has this good result, that as part of the wages are set aside each week and given the student workman only after he finishes the prescribed programme, he has a fund with which to start in life. This fund enables him sometimes to leave the thronged marts of his native country and seek more remunerative employmont in foreign lands. Expatriation of the graduates of the industrial school at Tournay is almost universal, and most of the ex-pupils occupy positions of trust in other countries.

Payment for the day's weaving in rural apprenticeship schools is an aid to the poorer peasantry and serves to lighten the burden of the bureaus of charity. Apprenticeship schools of this type are numerous in Flanders and are often kept up in connection with parochial schools or convent workshops. The pupils, it is true, learn a trade, and often follow it in after years. Some of these *ouvroirs* are, however, nothing more than workshops, clean and under good moral influences, where young and inexperienced labor is utilized at low pay; the peasants gladly accepting any stipend in return for having their children under proper care.

The economy with which the technical and industrial schools are administered in Belgium is remarkable. Considering their equipment, the excellent qualifications of the men who compose their faculties, the practical utility of their teaching and the results achieved, the Belgian schools are perhaps the cheapest in existence. The power of organization and administration is conspicuous; the sense of personal responsibility for the use of trust funds is very high; and the interest in education is both unselfish and widespread. More than all, greed for gain is not a ruling spirit. Men realize that there is something better to strive for than mere money getting; and foremost citizens lend their talents and efforts to the cause of education. As a proof of the admir-

able character of the promoters and directors of these institutions, the fact may be cited that, in almost every city, the alderman of public instruction or the mayor, who chiefly controls the schools, is either a university professor or a member of the national chamber of deputies or a professional specialist, in every case familiar with public needs and vowed to the public service, whether he be a renowned artist or a distinguished engineer.

The latest information with regard to industrial education in Belgium, later in most cases than the official school reports, is found in the admirable treatise, *L'Enseignement Spécial en Belgique*, by Monsieur H. Bertiaux. This book will be freely quoted in the following pages.

APPRENTICESHIP SCHOOLS.

The interesting report of M. de Ridder, professor at the university and alderman of public instruction at Ghent, made to the government in 1882, gives a discouraging account of these institutions.

Apprenticeship schools were established by the state as early as 1766 to teach lace making to the indigent peasantry. At successive financial crises occupation of one kind or another was provided by the authorities to relieve the destitution of the poor. As the introduction of machinery at the beginning of this century revolutionized Flemish industries, especially the flax manufacture, hosts of workers were without employment, and several communes opened weaving schools where even very young children were received and taught to read as well as to work. But in these workshops and schools combined, the educational features were in time sacrificed to the financial interests of exploiters of labor. Abuses grew up; work crowded out lessons completely, the hours of toil became excessive; children 5 and 6 years old were overtasked at lace making, the women lace makers and weavers grew more and more ignorant and incapable of performing household duties; the pay dwindled to a ridiculous pittance, and great misery ensued.

To counteract these results the state tardily intervened and limited hours of labor, insisted upon less work and more study, and prescribed a minimum compensation. Gradually, however, the apprenticeship school has languished and many have been suppressed. Such as are now maintained aim to supply employment during the winter to the children of the agricultural classes until the field work can begin.

In some localities a fine quality of work is produced and the training has a most salutary effect upon the young workers.

In the kingdom on December 31, 1889, as many as forty apprenticeship schools (*écoles d'apprentissage*) were subsidized by the state, with a total of 990 pupils (906 boys and 84 girls), 341 completing the course of instruction during the year.

These institutions have had their day of usefulness, and their importance is now declining, although they still receive subsidies. More than

one-half the expense of maintenance in 1890 was borne by the state, about one-sixth by the provinces, and one-fourth by the communes, leaving one-twelfth only to be supplied from other sources.

The first apprenticeship school founded at Ghent in 1817 was distinctly a charitable institution. All branches of the flax and woollen industries were taught, and lace making, embroidery, sewing, shoemaking, and carpentry, with book lessons of an elementary kind. In 1841 the state and the provinces granted subsidies to this and similar enterprises which resulted in their rapid multiplication. But, since 1849, every school thus endowed has been placed under the supervision of a commission named by the administration. Two inspectors visit the apprentice workshops at frequent intervals to see that the rules are observed. They promote the theoretical and practical education of the apprentices, and develop the technical knowledge of the foremen by means of lectures. Every year they make a report concerning the object of their mission.

In 1890, 35 of these workshops were in active operation, 26 in western Flanders, 8 in eastern Flanders. In the province of Namur, at Jemelle, is a school for girls, differing from the other *ateliers d'apprentissage* in giving only trade instruction, including hand and machine sewing, the making of common articles of dress, washing, ironing, and kindred pursuits. In 1890, 84 pupils attended. The course lasts two years and instruction is free.

Certain other apprenticeship shops possess special elements of vitality and admit of such development that at last they are transformed into trade schools, where the course of instruction includes, besides theoretical and practical weaving, the principles of mechanics and drawing, and the elements of primary education. Eight regular weaving schools have been recently founded, six being in western Flanders, where the children pursue primary studies at least an hour a day, under a public school teacher. Their labor at the looms is paid for at rates depending both on the pupil's aptitude and the contract with the manufacturer in charge of the shops—a part of the wages being held back, however, to purchase such an outfit as the pupil at leaving may need to carry on his trade at home. Prizes of money are also awarded for the same purpose, with the object of encouraging home industries and of giving the peasantry a resource on which to draw at seasons when agriculture can not be followed.

SCHOOLS OF AGRICULTURE AND HORTICULTURE.

There are several important schools of veterinary science, of agriculture, and of horticulture in Belgium. Of these the oldest and perhaps the best is the State Agricultural Institute at Gembloux. In 1890 this institution had 115 students pursuing agricultural studies.

Candidates for admission must be 16 years old, and, if not holders of a degree, must pass an entrance examination.

The course of instruction occupies three years. The studies of the first year are mathematics, rural engineering, land surveying and levelling, physics and meteorology, inorganic chemistry, botany, anatomy of the domesticated animals, general agriculture, external characters of the domesticated animals, sylviculture, mathematical drawing, practical farming instruction, and excursions.

The second year deals with hydraulics and irrigation, drainage, organic chemistry, analytical chemistry, mineralogy, geology, general zoölogy, animal physiology, management of domesticated animals, general agriculture, sylviculture, and horticulture, rural and constitutional law, bookkeeping, practical instruction, and excursions.

The final year's studies embrace general mechanics, mechanics applied to agriculture, rural buildings and country roads, agricultural technology, chemistry, zoötechny, microscopy, special cultures, sylviculture, rural and political economy, agricultural bookkeeping, practical instruction, and excursions.

Connected with the institute is a farm of 165 acres, in the cultivation of which the students take part. The cultivation of sugar beets is successfully carried on, and, notwithstanding the fact that in this industry the products of the soil are sold off, necessitating the purchase of large quantities of artificial fertilizers to maintain the productiveness of the fields, this farm yields an annual profit of $1,500.

Among the horticultural schools of Belgium may be mentioned the State Practical School of Horticulture at Vilvoorden, and that at Ghent bearing the same name.

In each of these schools the course of studies includes the French and Flemish languages, arithmetic, geography, geometry, and the elements of chemistry, physics, and geology. Bookkeeping, the construction of greenhouses, laying out of gardens, and the various branches of horticulture are also taught, and practical instruction is given in the gardens, nurseries, and greenhouses. At Vilvoorden candidates are admitted to the school at 17 years of age. The full course extends over three years. Resident pupils are charged about $40 per annum for tuition; non-residents, about $20. Many applications for admission are refused for want of room. The number of students in 1890 was 40.

The minister of agriculture, industry, and public works, M. de Bruyn, has taken special interest in the improvement of agricultural methods in Belgium. To that end, also, he has established dairy schools for women and girls in various farming districts. Competent men and women were first sent to study the agricultural and dairy schools of Germany, France, and England, who, besides, are well acquainted with all achievements made in this line in the United States.

The young woman who conducts the dairy school at Wevelghem, which may be taken as a type of this instruction, had been a delegate to England, and her methods are of the most practical character. A fine farm was first selected as an experiment station; and the pupils,

who are farmers' daughters or candidates for teacherships in the newer dairy schools, board with the owner's family. They milk the cows, overlook their feeding and housing, study cattle diseases, and inform themselves about pastures and foods. The dairy itself is equipped with the best and most improved apparatus, often two objects of the same kind but of different make or patent being provided to facilitate comparison of methods. For certain purposes English appliances are best liked; for others, American or German patents give best results, the pupil in each case making her own tests. A small chemical laboratory is usually at hand, where experiments of all kinds germane to the work go on. Lessons on subjects pertaining to agriculture and the dairy and exercises in bookkeeping and accounts occupy a few hours each day. Exact record is preserved of the amount of milk each cow gives, the quantity of cream taken from it, and the amount of butter and cheese produced. In short, after two or three years of such training, the pupils become either practical dairymaids or competent teachers, and leave the school with vastly higher ideas of the dignity and importance of farming as a life pursuit. When housewives may thus acquire a scientific grasp of the difficulties which beset the farmer's family and incline his womankind to desert the country for the overcrowded towns, it follows that the depopulation of the rural districts in favor of cities will be checked. Moreover, even in the remotest places, the government provides funds for and causes to be given annually a certain number of free lectures on farming topics, so that the whole agricultural population may learn something of modern progress.

HOUSEKEEPING SCHOOLS FOR GIRLS.

To supply the deficiencies of female education, and to qualify girls for the positions as wives and mothers which they are predestined to fill, housekeeping schools have been established all over the kingdom, and classes in domestic work have been attached to many public schools.

To a manufacturer, M. Smits of Couillet, belongs the honor of founding the first housekeeping school in Belgium, in 1872. The children of his workmen learned to sew, knit, mend, darn, trim, cut and fit, not only underwear and women's garments, but men's trousers, blouses, and waistcoats; to repair cloth, to cut patterns, and to use the sewing machine; to wash and to iron, to cook, and to make and bake bread. This school coming under the notice of the Prince de Chimay, governor of Hainaut, he started a similar one at Frameries in 1874. After having maintained this and several institutions of like character from his own purse for a number of years, the prince in 1877 requested the minister of the interior to incorporate the schools for domestic instruction with the official system of education. Now a network of such institutions covers the whole country.

Some of the most successful of these classes are conducted by the

Catholic sisterhoods in Brussels and in the provinces. Those carried on in convents and in public and parochial schools are administered on the most economical basis, the cost of superintendence being practically nothing. Moreover, almost every woman of rank in the kingdom has one or more such schools under her special charge, either in town or country, and overlooks every detail with the sisters. The wives of manufacturers, too, and other women in private life are founding courses for domestic work in villages and in districts which the government has not yet reached; so that here, as in the trade schools for girls to be described later, private initiative has been the entering wedge in bringing about these reforms. Already marked improvement may be observed in the homes of the miners and other working people within the radius of this instruction.

In 1889, under the auspices of the ministry of public works, a central committee of women devoted to the interests and propagation of housekeeping schools was formed, with the Countess of Flanders as president. In 1890 there were 20 communal or public housekeeping schools, 31 free housekeeping schools, 44 classes in household work annexed to communal schools, 15 classes attached to schools adopted by the committee, and 34 classes belonging to free schools. In 1892 these numbers had increased to 250. Appliances for teaching all branches of domestic economy are ample. For cooking classes the equipment is complete, all necessary kitchen utensils being supplied. Collections of various edible commodities are also furnished, and pupils are carefully taught the cost of the different articles of food.

HOUSEKEEPING SCHOOL, RUE LOCQUENGHIEN, BRUSSELS.

Of the many housekeeping schools established in connection with public, parochial, private, and trade schools for girls in Belgium, the best equipped, most scientific, and most advanced is located in the rue Locquenghien, one of the poorer quarters of Brussels. This is not connected with any other school. The pupils devote all their time to the course of instruction. The object is to train girls to be good housewives, or to become cooks, laundresses, and maid servants. Pupils go at 8.30 and remain till 4 or 5 o'clock, with interval for dinner, which is prepared by the group assigned to cook on that day, each group taking turns at all kinds of household work, washing, ironing, cleaning, filling lamps, marketing, cooking, darning, setting the table, and serving the meals. All the studies pursued bear on these practical exercises, theory and practice being united in every lesson. The girls are supposed to remain in the school three years, when they receive certificates of proficiency. The menus selected are such as would be used in poor and middle class households, with a view to encouraging the pupils to make the most in after life of small resources.

Every week two mornings are given to cooking by sections of the class in turn, and one day to washing, another to ironing. The rest

of the time is devoted to sewing and theoretical lessons. The cooking pupils work under the supervision of the teachers, purchase the supplies, settle the accounts, make and bake the bread, prepare the meals, and serve at table. In the sewing course the girls mend, darn, remake old garments, cut and fit, draught patterns, and in fact complete entirely the ordinary under and over garments worn by women and children. Tuition is free. Three courses are held each year.

HOUSEKEEPING SCHOOL, MORLANWELZ.

The equipment of this school includes a kitchen, laundry, sewing room, bread oven, provision room, and cellar.

Classes are held every week day from 8.30 a. m. to 4 p. m. with an interval of an hour and a half at midday. The attendance reaches from 50 to 80 pupils, who, to enter, must be 13 years old and must have completed the primary school studies. A forfeit of 3 francs (58 cents) is deposited, to be returned if attendance has been regular. Instruction is free and the course may be completed in one year.

The programme of study includes domestic economy, elements of hygiene and of accounts, kitchen work and needlework—in fact, practice in all the duties of housekeeping, with instruction as to qualities of foods, the greater or less nutritive value of different food-stuffs, their relative digestibility, the best modes of cooking, etc. Opportunity is thus afforded to acquire the knowledge and skill necessary to conduct a modest home, or to secure good positions in well-to-do families.

A convent school at Morlanwelz has a domestic section subsidized by the government and well managed, where all the housekeeping arts are taught—cooking, laundering, sewing, and fine embroidery. These classes are numerously attended and productive of much good among the working population. Small wages are paid to the children for sewing and embroidery.

HOUSEKEEPING SCHOOL, LOUVAIN.

This school for domestic work at Louvain has been opened in connection with a convent where boarding pupils are received; and the cooking and housekeeping classes are turned to practical use in providing for the daily wants of these *internes*. The intention is to train domestic servants; and a few girls who have followed the course have already secured positions in families. The classes are of too recent establishment to enable one to say whether they will succeed as a domestic training school. Of the utility of the instruction to the pupil in her own home and in after life there can be no question.

To multiply examples of these excellent housekeeping schools is useless. Whether annexed to the public schools, as at Verviers, Ixelles, and Ostend; to the night schools, as at Liege; to trade schools, hereafter to be described; to normal schools, as at Brussels; or whether existing as separate institutions with a corps of teachers and assistants,

the domestic classes are fulfilling a most useful mission, and bid fair to mitigate, if not to cure, some of the worst evils of industrial life.

TRADE SCHOOLS FOR GIRLS.

The Association for the Technical Education of Women was founded in Brussels in 1865, with a view to supplying omissions in the education for girls organized by the public authorities. Women dependent on their own exertions found themselves, it was urged, subject to most unfavorable conditions. Compelled to undergo a long apprenticeship under direction far from intelligent, or under employers bent on keeping their work people in menial and inferior positions, the toiler labored for the meanest wages. Chance, too, not aptitude, governed the choice of a profession; and competition and superior skill, on the part of rivals in industry, often drove the most deserving workers to the wall.

TRADE SCHOOL FOR GIRLS, RUE DU MARAIS, BRUSSELS.

With the aim of ameliorating the evils of apprenticeship, of training girls for special pursuits and opening up resources which can be pursued at home, of enlarging and extending the education acquired in primary schools—but which is so often forgotten in the struggle for existence—,the first trade school for girls was established at Brussels. Eighty-four members agreed to pay annually 36 francs ($6.95), and several subscribed largely. The munificence of Senator J. R. Bischoffsheim, however, put the enterprise later on a firm basis, and it was installed in its present quarters, 94 rue du Marais. From 1868 the city of Brussels adopted the school as a communal institution, without, however, depriving it of its independent government. It is still managed by a council of administration composed of fifteen members. Their meeting room is filled with the best productions of the drawing and painting classes. Every three months a conference, presided over by a government inspector, unites all the teachers for the purpose of discussion and criticism of a lesson given by one of the staff of the school, either practical or scientific. In 1878 the award of prizes was abolished, the pupils being trained to work well for work's sake, and not for the sake of obtaining a recompense. Exhibitions are given constantly, enabling the public to see the high standards attained in all branches, and putting the pupils in communication with employers to whom their skill and services may be useful.

The school was intended more for children of the middle ranks than for the very poor. In fact, it is the hardest working parents who are obliged to avail themselves of the earnings of their offspring and can not permit them to remain in class long enough to be really trained. In arranging the course of study such branches were selected as would afford a girl the best chance to become self supporting. Indeed, indus-

tries never before pursued in Brussels were actually created, as that of making artificial flowers, for which article Belgium had hitherto been dependent on Paris. Though the attempt was greatly opposed, the result has been that many Brussels shops now manufacture flowers. The pupils trained at the school are competent forewomen and teachers of the art, because their instruction covered the making and putting together of all kinds of flowers, whereas shop apprentices usually learn only one branch of the business. At first the pupil of the classes is not so rapid as the shop apprentice who turns out one flower year after year; but with some training at the shop she becomes a far better worker than those never at the school, and she is besides capable of teaching scientifically. So good is the class work, however, that the flower dealer who furnishes material for it and buys the product from the school makes money by his contract.

The introduction of trade classes was opposed, too, by well established industries, such as dressmaking. Dressmakers wanted apprentices who would drudge, run errands, or fashion one part of a garment all their lives. They objected to applicants who claimed to be able to make all parts of a garment, and who expected higher pay in consequence. The more enlightened women of the profession, however, lend all their influence to the trade school. Through the efforts of two of the leading dressmakers of Brussels, artists in their profession, who serve on the jury of award, drawing was made obligatory in the trade school, rue du Marais. In first-class establishments, they insisted, the workwomen first see the client, then sketch a design that suits her, draw the costume, and calculate by measurement the amount and cost of material, thus securing appropriateness and economy. Again, the fashionable dressmakers of Brussels furnish the school with new patterns as styles change. Their testimony is that girls who are graduated from the institution are more valuable, after some shop training, than workers not educated there, and that they often become forewomen and heads of departments. Indeed, the pupil, after getting a few years' practical experience in the work room, threatens to supersede the old line dressmaker entirely, since she knows more theory; she can design, she can create. On the other hand, girls leaving the school after three years' training sometimes assume to possess knowledge which only current practice can give. They have the theory of ordinary garments only, not of the higher creations of the dressmakers' art—artistic toilettes such as the luxury of the present day demands.

This school has taken almost a normal character and aims to reach young women in fair circumstances who are unwilling to work under the disadvantageous conditions that obtain in most workrooms, with long overtime and small pay. The intention is to train teachers and head workers. An important study is the history of costumes, and the drawing courses are very full and advanced, reproducing the costumes of all nations in all ages. The student knows just where

to seek sketches of toilets of a certain fashion or period, whereas uneducated dressmakers, preparing for historical pageants, fancy balls, or theatrical performances, spend hours in a library without finding the desired drawings.

Severe competitive tests are imposed on all applicants for teachers' places. Five candidates for a position as director of dressmaking at a school in the provinces were each given five separate tests before a committee: 1st, to write a description of a costume; 2nd, to draw it; 3d, to calculate the materials required and the cost; 4th, to make it; and 5th, to fit and adjust it finally.

Three applicants were marked 70 each, and two 100 each, the latter having had, beside the school course, two years' practice in a shop. Moreover, each candidate was required to give a lesson on this costume to a class; and in this demonstration all five were found deficient, none as yet having mastered the science of pedagogy. All, therefore, must study for some time before reporting for a second examination in the art of imparting ideas.

As yet in Brussels painting on china has not become a remunerative industry for girls, great experience being needed; but excellent work is done at the school of the rue du Marais. Some students go on into higher art, some give lessons, and a few successfully design stained-glass windows. In order to establish pupils and at the same time advertise the institution an employment bureau is conducted, through which girls are placed in good positions in industry and commerce.

The course of general instruction, pursued in the forenoon while the trade classes occupy the afternoon, includes French, Flemish, arithmetic, history, geography, natural science, hygiene, domestic economy, drawing, singing, and, in the commercial course, English or German. Drawing is the basis of preparation for all the trades, and is thoroughly taught. Lace designing, painting on porcelain, dress and underwear making, millinery, and the manufacture of artificial flowers are the chief industries followed. Girls who take the course in commerce understand bookkeeping by double entry, speak German or English, and have some acquaintance with geography and commercial law. The number of pupils is nearly 400, and the school budget amounts to 60,000 francs ($11,580).

The Association for the Technical Education of Women believes th[illegible] it is a mistake to teach women to earn their living unless they are al[illegible] taught culinary arts. When one can earn in two hours enough to hi[illegible] service for the day there is great temptation to neglect the household, spend one's life abroad, to go to restaurants and cafés. To counter[illegible] this tendency cooking is taught in the school of the rue du Mara[illegible] and in the vigorous new offshoot of the parent school in the rue [illegible] Terres Neuves housekeeping lessons are a specialty. Parents [illegible] tested; they objected to their children becoming "domestics." [illegible] president and council of administration persevered and finally decla[illegible]

that no child should have lunch in the building except those who would enter the cooking classes and prepare a meal at stated times. At last that department proved a success; and in most other trade schools of the kingdom cooking classes are now established features, started either by the government or by committees of women interested in industrial education; but there are yet great gaps to fill in this species of training.

Graduates from the rue du Marais school are employed as teachers in almost every trade school for girls in Belgium, and also in Holland and other foreign countries where their services are in great demand.

TRADE SCHOOL FOR GIRLS, RUE DU POINÇON, BRUSSELS.

A trade school nearly as old as that of the rue du Marais and equally important is in active operation in the rue du Poinçon, under the patronage of liberal thinkers and progressive educators—the outgrowth of private initiative also. Beginning with extremely modest resources, and about 70 pupils in 1873, in 1874 it had 150 students and the city of Brussels recognized its usefulness and subsidized it. In 1879 it moved to its present quarters, rue du Poinçon, with 229 pupils, of whom 104 held free fellowships. In 1882 it became a communal institution, managed by an administrative council of fifteen members.

The instruction comprises general studies, obligatory upon all pupils, and special or trade courses, one or the other of which each student must follow. Study is pursued in the afternoon, trades are taught in the morning, consisting of sewing in all its branches, underwear making, dressmaking, embroidery, drawing, and commerce. This school took the prize in Antwerp in 1885 and at Paris in 1889 for the most practical work exhibited. The courses aim at being practical above all things, and the results are admirable. In the dressmaking classes it is interesting to see any wrap or gown a visitor may have on sketched rapidly on the blackboard by a pupil, reduced to scale, a pattern of the garment cut out of muslin and fitted on the form, all in about twenty minutes.

In the sewing departments pupils the first year make up their own materials or sew for the *crèche*. By the third year they are able to do dainty work, ball dresses and bridal robes; but on graduation the fact is impressed on them that they lack practice in details of the art and knowledge of fashions and styles, and that, before setting up in business for themselves, they should serve a year or two in a dressmaking shop of the highest class.

The history of art is carefully studied, and pupils originate designs for embroidery and lace. In embroidery there are special courses. The Bohemian government sends pupils to this school to learn the art in order to teach it in the schools of Bohemia. Great attention is paid to the drawing; and the exercises of students of 13 preparing to be dressmakers compare more than favorably with what is called high

art in American academies. Every step of every process in dressmaking is first sketched, and then the pattern is draughted. Flowers for lace and embroidery are drawn from nature. Drawing is the foundation of the instruction in every trade.

Final examinations determine promotions to higher grades, and frequent exhibitions of work are held. Certificates are given to all who attain a certain high standard of excellence at the end of the course. The number of pupils is about 350.

The records as to the present occupations of graduates are more perfect in this school than anywhere else in Belgium. Many of these graduates are teaching in the city and provincial schools, and are holding positions of trust in foreign countries. The annual expenditure for the institution is about 40,000 francs ($7,720).

TRADE SCHOOL FOR GIRLS, RUE DES TERRES NEUVES, BRUSSELS

The Association for the Technical Education of Women was forced, on account of the number of applicants who could not be accommodated at the rue du Marais, to open, in 1888, a new trade and housekeeping school for girls. It is installed in handsome quarters in a populous industrial neighborhood, and already has achieved signal success.

Both the general literary studies and the domestic classes are obligatory for all pupils. The trades taught are underwear making, dressmaking, laundry work, and millinery. The school has three aims, viz., to aid pupils to obtain a trade or business suited to the female sex and to help them to an independent position; to initiate young women into domestic work and prepare them to direct their households with intelligence, order, and economy; to continue their primary studies and turn the lessons to useful account.

The domestic classes are a direct application of the lessons given in hygiene and domestic economy. The cooking course is varied with the seasons, and pupils go to market, purchase supplies, and calculate the cost of every ingredient and every meal. In other respects the school resembles its model, rue du Marais, and bids fair to equal it in point of numbers. On the practical side the instruction is more thorough; on the ornamental side less extensive than at the parent school, rue du Marais.

The general course comprises French, Flemish, arithmetic, accounts, geometrical drawing, history, geography, natural science, hygiene, domestic economy, maternal instruction, singing, and gymnastics.

The trade course includes sewing, dressmaking, underwear making, washing, starching, and ironing.

The housework course consists of mending, patching, and the necessary sewing for the family, cooking, house and furniture cleaning, the washing of toilet articles, and various other household duties.

INTERMEDIATE TRADE SCHOOL FOR GIRLS, ANTWERP.

This school was created in 1874 by an association whose object was first to prepare young women for the normal schools, and then to train them for trades without the intervention of the usual apprenticeship in shops. Subsidized by state and city, it is, like the Brussels trade schools, governed by a council of administration of fifteen members, and the instruction follows much the same lines. The studies last five years, two of which are preparatory. Of trades the pupil may select underwear making, dressmaking, cutting and fitting, and drawing and painting applied to various industries. The school is so largely attended that its present domicile is almost inadequate.

TRADE SCHOOL FOR GIRLS, GHENT

In 1888 the city of Ghent transformed its communal *ouvroir* or apprentice school annexed to the public school of the rue du Nouveau Bois into a regular trade school for girls.

The literary and trade courses resemble those of the other Belgian trade schools, lasting three years, and presupposing a primary education. At entrance the parents or guardian of the pupil agree to pay when the young girl shall have completed the course the sum of 90 francs ($17.37) as tuition, which, however, is always remitted to students who finish with credit, as a recompense for faithful application.

The dressmaking department, following the plan of the Paris schools, has established an outside *clientèle*, and sews for regular customers; the workers being supposed to gain greater practical knowledge by making costumes for outsiders than in sewing on their own materials or constructing useless models. Pupils assist the mistress in fitting, draping, and trying on. The proceeds of the work go to the school fund, although this plan is sometimes varied by paying the workers small wages, as in the tailor schools for boys. Drawing is here, as elsewhere, a prominent feature of the industrial training.

TRADE SCHOOL FOR GIRLS, VERVIERS.

This school was established in 1886 by private initiative, and is managed by a committee of nine members. The course of instruction combines literary studies and certain trades. Modifications have lately been made by which more attention is paid to natural science, hygiene, and domestic economy. The other branches pursued are commerce, German, industrial drawing, with special relation to trades, dressmaking, underwear making, and painting. Much stress is laid on proficiency in drawing, and the achievements of the pupils are extremely creditable. Certificates are given to pupils passing good examinations. The attendance numbers nearly 200.

TERMEDIATE TRADE SCHOOL FOR GIRLS, LIEGE.

of Liege supports a trade school for girls as important and hose in Brussels. Besides the obligatory general studies, to inferior, intermediate, and superior, seven special courses ırsued, viz., history and literature, commerce, dressmaking, making, artificial flowers, drawing, and painting. In the classes there were in 1892, 37 pupils; in commerce, 86; in ng, 182; in underwear making, 53; in artificial flowers, 16; in 26; in painting, 17; making, with special pupils, a total of ɔndance.

sons in flower making commence with the cloth in the bolt, every step—dyeing, making, assembling; they last four years ught by a practical flower maker, the head of a large manu- Many advanced trade pupils omit the literary studies of the ınd pursue only the industrial work of the afternoon. The f instruction is founded on the intuitive principle, and aims) originality and to reveal natural aptitudes. The school good collections of casts, charts, chemical and physical ap- nd a small library. The trade instruction is graded, draw- ıg the basis of it. After studying the first elements of form e found in life and in nature, in landscapes, in plants and Geometry and perspective are insisted on, and the æsthetic l the history of art are presented in a way to appeal to the ɔn and to furnish exercises useful in the practice of the ıure trade.

ching staff consists of a director, a subdirector, ten teachers ghest or regent grade, two governesses, five mistresses for Jerman, and English, a professor of natural science, a teacher stics, a superintendent of industrial work, six dressmaking nderwear making teachers, one mistress for artificial flowers, a and three drawing teachers, and a painting teacher besides. tant work accomplished by this excellent institution justifies yment of so large and competent a faculty.

PAROCHIAL TRADE SCHOOLS.

ochial trade and industrial schools in Belgium deserve men- dmirable schools of Saint Luke being by far the best.

aint Luke schools complete, as it were, the course of Catholic n, receiving the pupils after their first communion and teach- ıntil they are about 20 years of age and have become self sup- orkmen. Graduates are in great demand by employers, be- heir skill as artisans, and many have set up in business for s, and in their own shops direct large numbers of workers at metal, decorative painting, stained glass, engraving, and are architects of wide renown, two are univer-

sity professors, and many others are teachers of drawing and architecture in important schools. In foreign countries, too, they have had signal success, having established industries in France, Holland, and England.

The Ghent school was the first of the Saint Luke schools, having been founded in December 1862 by the Society of Saint Vincent de Paul. In January 1863 it was formally opened with 12 pupils from 12 to 15 years of age. By October of the same year 40 boys were enrolled; and at present 600 students of various ages, from 13 to 25, are in attendance.

At the anniversary of the founding of the Ghent school the association of alumni gave to the institution a fine building, consisting of a museum and library combined.

Under the same authority and pursuing the same course of study schools have been established at Tournay, Liege, Brussels, and Courtrai in Belgium, and at Lille in France.

The Saint Luke schools aim to aid young men, particularly the sons of artisans, to acquire the theoretical and practical knowledge necessary to attain an honorable position and insure their efficiency in various occupations, as architects, managers of public works, sculptors, wood engravers, and painters. All the instruction is essentially practical, and the importance of drawing is fully recognized.

Ten years are required to complete the full course, but only those pupils destined to be architects remain so long. Four or five years suffice to give a good, artistic training as skilled workmen.

Tuition is free, and the financial resources of the Saint Luke schools are derived principally from subscriptions. The Ghent school, with 600 pupils, receives from the state a subsidy of 5,000 francs ($965), and from the province 1,500 francs ($289.50). The Tournay school has 150 pupils, Liege 100, and that at Schaerbeek, Brussels, founded in 1887, is attended by upwards of 400 pupils, and gets from the state 5,000 francs ($965).

TRADE SCHOOLS FOUNDED BY GUILDS AND TRADES.

Trades and trade unions in Belgium recognize the importance of giving apprentices more thorough training than is now generally obtainable since old fashioned apprenticeship, under which a boy might be bound out to a master, no longer exists in the kingdom. Just as the ancient guilds of London are at present endowing and even founding technical schools and classes, so the time honored "syndics" or guilds of Belgium, or their modern representatives, the master tailors and brewers, are taking steps to train workmen to greater technical proficiency.

At Louvain the Saint Peters Trade School was founded in October 1888 by the corporation of trades and commerce of Louvain. The course was fully organized in October 1889 in a fine domicile, and the

plan of study embraces drawing and elaborate trade instruction. The trade classes comprise tailoring, both cutting and sewing; carpet making, shoemaking, blacksmithing, stained glass, carpentry, joinery, decorative painting, plumbing, slating, masonry, and a botanical course for gardeners. The teachers are either scientific and technical school graduates or practical manufacturers and foremen of workshops.

In each department instruction is given also in physics and in commercial accounts. The object of the lessons is to obviate routine and to supply to the student workman those omissions in his all-round training which the specialized shop work surely entails.

Pupils must be at least 12 years of age in order to enter. The school administration is carried on by a commission appointed by the grand council of the corporation, and is composed, for the most part, of employers and workingmen. One member of this commission is charged with the daily direction of the school. Its expenses for 1890–'91 amounted to 7,450 francs ($1,437.85). In 1891 there were a hundred pupils in the drawing school and a hundred in the trade classes.

SCHOOL FOR TAILORS, BRUSSELS.

The master tailors at Brussels, finding no properly qualified journeymen tailors, resolved to establish a school for training skilled workmen.

The first Belgian school for tailors was opened at Brussels, April 12, 1880, under the control of the master tailors. The theoretical course includes French, arithmetic, accounts, geography, history, and drawing, while in the practical department pupils undergo a three years' training which qualifies each one to make his garment (*faire sa pièce*). The first year is devoted to a complete course in sewing; the second year to completing the separate parts of a garment; the third year to putting together, pressing, and finishing the suit. A fourth year is sometimes added, after which the pupil may consider himself a finished workman.

Cutting lessons were purposely omitted from the course of study to counteract the tendency in the trade for all men to become cutters, while nobody was left to do satisfactory work with the needle. The employers believed that to create a supply of skilled journeymen would conduce to their own advantage and greatly improve standards in the business of custom tailoring. They agreed to give preference, always, to workers completing the prescribed course; and to the progressive spirit of the master tailors of Belgium the credit is due for the creation of excellent trade schools.

On account of the sedentary nature of the trade a complete course of gymnastics is obligatory, under a competent professor connected with the school. The teaching staff consists of a director, professional tailors to supervise the actual work of the shops, and a professor of science.

A tuition fee of 60 francs ($11.58) a year is charged all pupils, but the Brussels poor pay no entrance fee; other pupils of the city pay an entrance fee of 50 francs ($9.65), and those living outside the city limits 100 francs ($19.30). After six months' probation, for all lads who have been faithful there is set aside in the school treasury a certain wage, consisting of 1 franc (19 cents) a week the first year, 2 francs (39 cents) a week the second year, and 3 francs (58 cents) a week the third year; and the total is given to the pupil on graduation, but he forfeits it if he leaves without completing the course. In the fourth year the worker receives all that he can earn. The school is well managed and is fulfilling admirably the ends for which it was established. Ex-pupils holding certificates of proficiency have obtained lucrative employment in foreign countries.

In 1889–'90 there were 32 boys in attendance. In 1892 applicants were being refused. The annual budget amounts to 12,000 francs ($2,316), the state aiding with a subsidy of 2,000 francs ($386), the city paying 1,200 francs ($231.60), and the province 700 francs ($135.10), the master tailors subscribing the balance over and above receipts.

SCHOOL FOR TAILORS, LIEGE.

On a similar basis is organized the School for Tailors at Liege, founded October 2, 1888, under the patronage of the government, the province, and the city. In 1890, 33 pupils were enrolled; the state subsidy was 2,000 francs ($386), that of the commune and province being 750 francs ($144.75) each. In 1891 there were 48 pupils. The earnings reserved for the boys amount to less than at Brussels, but the quality of work done is so fine as to have excited the admiration of renowned London firms.

At Binche a school for tailors was opened in 1890, by the communal government, with 20 attendants.

SCHOOL OF TYPOGRAPHY, BRUSSELS.

The School of Typography (*École de Typographie*) at Brussels originated in the efforts of the compositors' union to improve the conditions of apprenticeship.

In most printing rooms the child entering to learn the trade of typesetter was a mere drudge and runner, carrying proof sheets, and doing almost menial work, and, after passing years at the business, he did not know even the elements of his trade. So many incompetents were thus enrolled in the calling that the union asked employers to require candidates to pass an examination, and in 1882 this rule was adopted. The large number of candidates rejected, though the test was simple, dismayed the union and proved the great need for proper technical training. In 1886 the union called a joint meeting of its members and the largest printing firms, with a view to establishing a trade school;

and through the efforts of the Printing Club and Library, the Printing Guild, M. Jean Dumont, editor of *Le Typographe*, and others interested, the Brussels School of Typography was opened in 1888. The significant fact was recognized that, in those countries where technical instruction was advanced, as Germany, Austria, and Italy, printing had reached great artistic perfection; and France, not to be outdone, had opened a school for compositors at Paris, and was then building a model institute for teaching the art of book making.

As a result of prolonged conferences and mutual concessions on the part of employers and the union the school was at last established, the publishers of Brussels agreeing to accept no workmen under 14, and to send all beginners to their free trade school.

After five years' attendance pupils pass an examination and receive a diploma which entitles them to the wages of a skilled workman. The governing committee of the institution is made up half of employers, half of workmen.

The course is divided into two parts, one giving technical, the other literary instruction. Technical teaching keeps pace with that of the text book, and the pupil advances systematically in the knowledge of his trade to a full mastery of the printing art. During 1890, 71 young men were enrolled—19 in their first school year, 24 in their second, 18 in their third, and 10 in their fourth. The classes are held at night, and during the day the pupils may be found scattered throughout the principal composing rooms and publishing houses of Brussels. The expenses amount to about 7,500 francs ($1,447.50) annually.

BREWING SCHOOL, GHENT.

A model brewing school was opened at Ghent in October 1887, founded by the Belgian Society of Brewers.

The school is divided into two sections. The first section is designed for the theoretical and practical training of foremen and journeymen brewers; tuition is free. The second section, not gratuitous, provides a complete education in the art of brewing for proprietors or directors of breweries.

During the first year 36 pupils were in attendance; of whom 13 were established brewers, 14 were sons of brewers, and 9 were aspirants to the position of brewers or directors of breweries. All these were pay pupils; but, besides, 27 attended the gratuitous section.

Stimulated by this success the organizers of the school still further developed their plan, and, in 1890, completed their work by the establishment of a scientific station, similar to those that exist in Germany, in England, and in Denmark, whose office is to study all the questions of a scientific nature that pertain to brewing.

The school now consists of three sections—a free section, a technical pay section, and a higher pay section. The gratuitous branches are French and Flemish brewing, applied mechanics, practical wor-

m the brewhouse, and excursions to breweries. The course includes instruction as to waters available for brewing purposes, the barley, its germination, drying of the malt, methods of testing the malt, brewing by the methods of infusion, decoction, etc. In short, every process of the art is fully explained and demonstrated. The courses are given alternately in French and in Flemish, for 24 consecutive Sundays; and, on certain week days, pupils practise in the breweries of the city. At the close of the school year the pupil is examined by a committee composed of two professors and four members of the administrative council of the school. With a possible 1,000 points the pupil may obtain 100 points for diligence in study, 600 points for the highest excellence in the course of brewing, and 300 points in mechanics. Graduates of the Ghent school are highly esteemed, and they obtain large salaries. The average is 1,800 francs ($347.40) a year.

The technical course, for which 500 francs ($96.50) a year is paid, and the higher course, for which 250 francs ($48.25) is paid, include much more of the theory, chemistry, and technology of brewing. A complete bacteriological laboratory has been equipped, and a model brewery is connected with the school, with a library containing Belgian, French, English, German, and American brewing journals and reviews.

The school budget of 1890 amounted to 30,000 francs ($5,790); state subsidy, 5,800 francs ($1,119.40); provincial and city subsidy, each, 500 francs ($96.50). Since the founding of the school in 1887 the Flemish course of the gratuitous section has been followed by 54 pupils, and the French course by 57. In the professional section 162 pupils have been enrolled; and at the opening of the superior section in 1890, 13 pupils entered the new department, most of whom were master brewers or the sons of established brewers.

As a proof of the excellence of this Ghent school, the new scientific brewing institute at Berlin has adopted the same plan of study in the botanical course; and the new school of brewing at Lille (established in October 1890) has selected a course identical with that at Ghent.

TRADE SCHOOLS.

No manual training schools of the type of those in Saint Louis, Toledo, New Orleans, Chicago, and Baltimore exist in Belgium. The nearest approach to their educational idea is embodied in two institutions, one at Ghent, newly established, the other at Tournay, one of the oldest foundations in the kingdom. The Tournay school, though called an industrial school and ranked as such in all catalogues, departs so widely from the lines pursued by the other industrial schools that it is more convenient and also more exact to describe it among the trade schools, of which it is by far the most important.

INDUSTRIAL SCHOOL, TOURNAY.

The original aim of this establishment was to do away with the disadvantages of apprenticeship, which is usually passed under conditions unfavorable both to the technical proficiency and the character of the young workman.

In 1841 a school of arts and trades was opened at Tournay to perfect workmen in local industries, to turn out good foremen and artisans—in a word, to teach manual labor properly. At first a boarding department was attached to the school, and workshops for hosiery, carpentry, casting iron and copper, locksmithing, and modelling. The whole was under the control of the clergy. Pupils were admitted at 8 years of age, and could remain till they were 21. The price of board was 100 francs ($19.30) a year, besides which the school appropriated three-fourths of the earnings of the pupil in the shops, the other fourth being reserved for the boy till his departure from the establishment.

In 1860 the institution reorganized more on the model of other industrial schools, retaining, however, the special workshops where the students were regularly employed all day; but, after 1865, it was no longer administered by priests, and the boarding department was kept entirely distinct.

As the school is at present operated, a theoretical industrial course as well as shop work, is obligatory upon all pupils. This comprehends arithmetic, geometry, mechanics, physics, chemistry, industral economy, and drawing, the first year being preparatory, the regular studies covering three years besides. They are pursued only in the early morning in summer and in the evening in winter. Drawing occupies six hours a week. The day is devoted to shop work.

The government contracts with a large manufacturer to assume the responsibility of carrying on the school shops, where he is at liberty to engage, too, his own workmen; but he agrees to furnish always definite employment to the pupils at fixed rates. The classes in iron or wood work labor in squads under a teacher or foreman, performing all the processes requisite in the manufacture of the product. Such constant change of employment is, however, insisted on by the director of the school to prevent the lad from being a mere automaton or a routine worker, and to enable him to become proficient in all branches of his chosen trade.

Each student workman's earnings are partly reserved for him until his majority, partly turned into the school treasury. The pupils are mostly over 14 years old, and each candidate serves six month probation before being finally received. If one shows no aptitude for a trade he is sent back to his parents. On entering the boy selects a his specialty either wood work or iron work, not both. The shops actually in operation admit of considerable liberty of choice among such pursuits as carpentry, joinery, iron casting, fitting, turning

core making, and copper work. Of late a special class has been sent to a shop in the town where most beautiful and artistic ornamental iron work is produced.

The average yearly attendance is 125, and pupils come from Holland, England, Spain, Russia, and even America. The state contributes to the support of the school the sum of 21,000 francs ($4,053), while province and commune each give 7,000 francs ($1,351) a year. The book work accomplished is less than that which American high school boys undertake. In winter the theoretical course is followed by lads of the town who do not enter for shop work, which swells the enrolment to 250, and entitles Tournay to class itself with other Belgian industrial schools.

TRADE SCHOOL, GHENT.

As Tournay represents the earlier ideas regarding apprenticeship, the trade school for boys at Ghent stands for modern achievements in technical instruction; but the object is not, as in American manual training schools, to educate and to develop faculty, it is to form the best possible artisan by means of scientific preparation.

In 1882 M. Lippens, mayor of Ghent, announced that the creation of a school of apprenticeship, where children coming from the primary schools could be instructed in wood and iron work, would be an essential measure of policy.

In 1883 M. Lippens and M. Dauge, the alderman of public instruction, visited the apprenticeship schools of Paris, Rouen, and Havre. The Havre school particularly attracted their attention, both on account of its excellent organization, and because of the results obtained. Various circumstances conspired to delay the execution of M. Lippens's project. But in 1887 the aldermanic college sent a special delegate, M. Devylder the present director of the school, to Havre to study the apprenticeship school of that city in all its details, as much from an educational point of view as from the trade and administrative standpoint. The favorable report of M. Devylder induced the board of public instruction to found a professional school for boys, and a course was opened in October 1887.

In 1890 the school was commodiously installed in a building erected especially for its accommodation. The course of study includes Flemish, French, arithmetic, practical geometry, accounts, the elements of physics and mechanics, a practical acquaintance with metals and common woods, and drawing. Lessons and shop work in the well equipped school work rooms alternate during the day. No classes are held at night.

The pupils select either wood or iron as their specialty, and the shop instruction differs, accordingly, from the very first, although almost the same theoretical course is covered in both departments. Manual and mental exercises are so combined that, after three years' application,

the students are qualified to enter upon their particular trade. The iron work is specialized into forging, fitting, turning, and locksmithing. Boys aged from 13 to 16 may enter, and they must have attended for one year at least the highest class in a primary school.

This institution is equipped with one 12-horse power engine, fifty-five vises, six lathes (iron), one Whitworth plane, six forges, two ventilating fans, one ribbon saw, three power lathes for wood work, and forty-five complete sets of carpenters' tools. It is the intention to add immediately other important machinery and tools, and to make the school the equal of any of its kind on the continent.

Twenty-five pupils attended when the classes were first opened; in 1890, 85 followed the course; in 1892 every place was filled, and applicants were turned away. A committee of twelve influential men has a general oversight of the school shops and assists in securing for graduates positions in some one of the many large industrial establishments of Ghent. Indeed, employers find the trade school boys very valuable workmen. The average pay they receive at first, in wood working shops, is 1 franc 60 centimes (31 cents) a day, and in iron works they get about 1 franc 80 centimes (35 cents) a day—considerably more than youths of the same age earn who have not had the advantages of the trade school.

The teaching staff consists of a director, a subdirector, instructors, and foremen. The annual budget amounts to 27,060 francs ($5,222.58), the state granting a subsidy of 6,000 francs ($1,158), and the province 2,000 francs ($386).

NATIONAL SCHOOL OF WATCHMAKING, ELECTRICITY, AND APPLIED MECHANICS, BRUSSELS.

The National School of Watchmaking, Electricity, and Applied Mechanics at Brussels was founded in 1886 by private enterprise aided by the state, the province, and the city, with the design of furnishing young men the means of acquiring necessary theoretical and practical knowledge of all the branches of watchmaking, of the applications of mechanical principles to the construction of instruments of precision, and of electricity.

The school is exclusively technical without the least reference to the commercial value of its products; but, nevertheless, a commission is authorized to sell the objects made by the pupils. The studies cover four years, beginning August 1 and ending July 1, each year. Both the theoretical and the practical courses are strictly obligatory.

The practical instruction includes preparatory education and preliminary work common to all branches of mechanical precision; the complete construction of a watch; the making of the movements; the setting up of all the parts of watches, old and new; electric clocks; chronometry; telegraphy; telephony; electric signals; the making of

instruments of precision; the construction of apparatus for purposes of demonstration in the school museum, etc.

The theoretical course includes mathematics, physics, chemistry, cosmography, mechanics, elements of bookkeeping and accounts, French, and industrial economy.

Certificates are conferred after examination on pupils who have completed their four years' apprenticeship. A travelling scholarship is granted to the pupil who finishes his studies with the highest credit, on the condition that he will report, within the year, on the visits he may make to trade schools abroad.

For admission pupils must be at least 14 years of age, and possess, as a minimum, the education covered by the primary school course. The tuition is fixed at 250 francs ($48.25) a year, but the administration gives scholarships or half scholarships free. Pupils serve a three months' probation. The annual budget of the watchmakers' school amounts to upwards of 15,000 francs ($2,895). The number of pupils varies from 20 to 25.

COURSE FOR STEAM ENGINEERS, NAMUR.

A course of instruction in locomotive driving and management of steam boilers (*cours de manœuvre et d'entretien des machines à vapeur*) was established by the state at Namur in 1876. The teaching is conducted on Sundays, is public and free, and the state railroads allow a reduction in fare to those attending. Certificates are delivered at the end of a year to pupils who possess sufficient knowledge of the branches taught.

SCHOOL FOR FISHERMEN, OSTEND.

At Ostend a practical training school for fishermen was established in 1885 at the suggestion of M. Charles Janssens, who charged M. Defever, director of a free primary school, to draw up a special plan of studies for pupils destined for the occupation of fishermen. In 1887 the fishing school was divided into two (higher and lower) departments.

With the third year of primary studies in this school begins the technical instruction, which includes naval construction, navigation, the compass, exercises in finding one's latitude and longitude, the North Sea, principal food fishes of the North Sea, places and seasons for fishing, implements for catching fish, preparation and curing of fish, etc.

In the fourth year the same studies are more extensively specialized. The variations of the compass are accounted for, and the corrections necessary for determining the true course are explained. Then the ocean currents are studied, the ebb and flow of the tides, high and low tides, the winds, their action on the sails, the water, sea charts, lati-

tude and longitude, calculation of distances, determination of routes, etc. The coast lines are modelled and made familiar, viz., the Belgian coast, and those of Holland, Germany, Denmark, Norway, and England. The formation of the shore of the North Sea, fishing stations, situation, distance and depth of the waters are also taught. Instruction is given in the laws and international conventions concerning fisheries, in all the arts of marine fishing, and in the repairing of apparatus. In the fourth year a course in English is followed, with special reference to the use of the chief nautical terms.

During the year 1890–'91, 188 pupils attended this school, as follows: First year pupils, 60; second year, 50; third year, 42; fourth year, 36.

The budget for 1890–'91 amounted to 2,400 francs ($463.20). The state, the province, and the commune pay, each, 800 francs ($154.40).

Since the founding of this department 100 pupils, having completed the studies of the school, have secured places on fishing vessels.

The free school of Ostend, another establishment for the training of the sons of fishermen, was opened in 1890. The course requires two years for its completion, and 68 pupils were enrolled during the first year. The total cost of the school aggregates 4,000 francs ($772). The state subsidy is 1,500 francs ($289.50); the provincial, 500 francs ($96.50). The deficit is covered by special subscriptions.

SCHOOL FOR FISHERMEN, BLANKENBERGHE.

In 1890 a free fishing school of lower rank was opened at Blankenberghe, near Ostend. The instruction is given in winter, when the fishermen are at home, and on Sundays. The course is well arranged, and is sufficient for acquainting fishermen with all the ordinary duties pertaining to their craft.

The law of May 27, 1890, making it obligatory upon any one sailing in the capacity of master of a fishing vessel to possess a certificate of qualification, has had a salutary influence on the attendance at the fishing schools of Belgium.

Bertiaux says, too, that Holland, having enjoyed this special form of instruction for twelve years, has derived great advantage from it, not only in the matter of her fishery interests, but in the development of her merchant marine. In Holland it has been long understood that maritime fishing is the best possible apprenticeship for the formation of good sailors.

INDUSTRIAL SCHOOLS.

The aim of the Belgian industrial schools, says a government report, May 7, 1886, on the Condition of Industrial and Trade Instruction in Belgium (*Rapport sur la Situation de l'Enseignement Industriel et Professionnel en Belgique*), is to give a workman scientific instruction bear-

ing on his trade which he can not acquire in the shop; to develop his intelligence by acquainting him with the general laws of matter; and to free him from the tyranny of routine, enabling him to increase his economic value and thus better his material condition.

These institutions are essentially communal; perfect autonomy of management is left to the province or commune. The commune or municipality appoints teachers, prepares the expense budgets, arranges programmes and rules, in fact, administers the schools. The government reserves only the right to approve and inspect with a view to control the general management of these institutions by virtue of its subsidy bestowed, and to aid in their development and improvement.

At the close of 1889 there were fifty-four industrial schools in Belgium, some founded by private initiative, some by the state, with a total of 14,947 pupils, of whom 1,304 were girls.

In 1892 thirty-five of the most important of these establishments are described by Bertiaux in his book on technical education. These schools are located as follows: Anderlecht, Antwerp, Arlon, Ath, Bruges, Brussels, Charleroi, Châtelet, Courtrai, Fontaine l'Evêque, Furnes, Ghent, Gosselies, Hasselt, Houdeng-Aimeries, Huy, Jamioulx, Jemmapes, Jumet, La Louvière, Liege, Louvain, Marchiennes au Pont, Morlanwelz, Namur, Nivelles, Ostend, Pâturages, Saint-Ghislain, Seraing, Soignies, Tournay, Verviers, Vilvoorden, Ypres. Certain special courses, as photography at Brussels and steam engineering at Namur, are included.

In 1888 subsidies for the support of the industrial schools proper were granted to the amount of $50,809 from the state, $18,371 from the provinces, and $44,155 from the communes; aggregating, with receipts from other sources, $138,336. The special schools and courses also receive liberal subsidies.

The value of these institutions to the laboring classes can hardly be overestimated. They meet the needs of various kinds of wage earners. Workingmen's children, who become bread winners as soon as the factory laws allow, and even before, find in night study at the industrial schools the instruction which otherwise they would never have leisure to secure. Older men, moreover, discovering at the shop what they lack in efficiency, what hinderances bar their advancement, what influences must be counteracted, start in, even late in life, to supply the want by systematic training, which may be had absolutely without cost. Laborers 50 years old are not ashamed to seize such tardy opportunities; and numbers of workingmen assert that they were fathers of large families before the chance occurred to enter on this coveted instruction.

More and more value attaches each year to certificates from the industrial schools, and many foremen and superintendents make it a point, in engaging or promoting workers, to require this test of capacity.

Employers in general are strongly in favor of such practical industrial training, and some of them aid the schools financially. A few employers, however, object that the tendency is to overeducate the laborer, so that all workingmen expect to be captains of industry and none are willing to perform the duties of a private.

INDUSTRIAL SCHOOL, ANTWERP.

Many Belgian schools, to which reference will be made, have been inspected by a British royal commission. The following statement concerning the Antwerp Industrial School is quoted from the report of this commission:

The Antwerp Industrial School is an evening school for workmen, who go through a definite course of instruction, having lessons in geometry, elementary science, and in drawing in its special application to various trades. The teaching is free, and is given in the Flemish language. In addition to the general course of instruction, which all the students of this school, as of other similar schools in Belgium, are expected to follow, the commissioners found classes in which workmen are taught various special trades, such as wood graining and painting in imitation of marble; these being industries carried on in the city of Antwerp. Twenty-seven pupils were at work in this class. The school contains 150 pupils in five classes. They enter at the age of 14 and upwards, and remain four or five years. By a special ministerial decree children from the primary schools, who can satisfy the conditions of entrance, are admitted at the early age of 12 years. Most of the pupils, however, have already spent more or less time in the workshop, and have, therefore, gained some familiarity with the practical details of their trade. The lessons take place between the hours of 6 and 9 every evening. Here, as in almost all other schools in Belgium which the commissioners visited, special attention is paid to drawing.

It is worthy of notice in connection with this school, as well as with other schools in Belgium, that the pupils are expected to go through a complete course of instruction as laid down in the programme for each year, and do not select such subjects as they themselves may consider to be more especially applicable to their own work. There is a preparatory course for young men who are not sufficiently advanced to enter the school. The annual cost of the establishment is $4,379.85, part of which is contributed by the town and part by the province and by the state.

The criticism of the commission with regard to the rigidity of the programme of study is hardly applicable at the present time. Students take up one or more branches of the course as time and capacity allow; or they pursue some branches one year, others the next, until the whole plan of instruction is compassed.

The Industrial School at Antwerp was founded in 1860, and reorganized in 1866. The instruction, given in the Flemish language, comprises drawing lessons and the following scientific branches: Arithmetic, algebra, geometry, bookkeeping, hygiene, industrial legislation and economy, physics, chemistry, mechanics, and steam engines, with special courses for stationary engineers and in the materials of construction.

Drawing includes linear, ornamental, geometrical; drawing from lines and from solid models, bas-relief, perspective, architecture, imitation (graining) of woods, marbles, and shells, plans for gardening, and sketching machinery.

The course covers four years, besides a preparatory term which pupils enter at 12 years of age. Classes are held almost entirely in the evening and on Sunday. In 1890, 355 pupils were registered. The state appropriated 9,500 francs ($1,833.50), the province 4,500 francs ($868.50), and the city 11,000 francs ($2,123).

INDUSTRIAL SCHOOL, BRUSSELS.

This institution affords a high order of technical instruction and resembles in some respects an engineering school, though intended chiefly for foremen and workmen. It was established in 1869 by the communal government, with the assistance of the province and the state. The curriculum requires three years for completion and includes the higher branches, such as geometry in its application to perspective, to stone cutting, and to timber; a full course in the construction of buildings; special courses in electricity, chemistry, and designing machines; and unique and valued lessons in the art of photography. On Sunday mornings the building course is very largely attended by workmen in the building trades, particularly those in the employ of the city.

Pupils must be at least 14 years old, must be able to read and write well, and must know the four fundamental rules of arithmetic. Regular students study for certificates; the free pupils—those not bound to attend regularly—may listen to the lectures merely on presenting a card of admission.

Certificates of two kinds are awarded, general and special, the latter being for mechanical designing, electrical and civil engineering, and chemistry.

This institution boasts of a fine technological library of about 12,000 volumes, a chemical laboratory, a physical cabinet, mineralogical collections, etc. In 1889–'90 there were 553 pupils enrolled; of this number 212 were studying civil engineering, 68 mechanical design, 42 electrical science, 4 chemistry, and 16 photography. The school budget called for 124,372 francs ($24,003.80).

INDUSTRIAL SCHOOL, CHARLEROI.

On account of the importance of Charleroi as an iron and coal centre, great interest attaches to the success the city has attained in affording a very high grade of scientific training to its thousands of miners and skilled iron workers who get their practical experience in the mines, fonderies, furnaces, and rolling mills of the vicinity. It is a proof of the intelligence of the working classes that these purely scientific advantages

are so fully appreciated. Lads, adult laborers, foremen, miners, skilled artisans, after deriving as much good as possible from the excellent industrial schools of their own immediate commune, such as Monceau-sur Sambre and Marchiennes au Pont, flock to distant Charleroi at night and on Sundays, not daunted by fatigue or inclement weather. Pupils even come from the far away communes of Brabant and Namur.

The school aims to supply in a practical way the special theoretical needs of all kinds of wage earners, and new studies are constantly being offered as the demand arises. The latest course is one in the opening and management of mines (*exploitation des mines*); and it has assumed such value and importance that hundreds of miners frequent it on Sundays, spurred on by the fact that promotions at the mines are now granted chiefly to those who hold diplomas of capacity in this study.

The Industrial School of Charleroi, now under the able direction of M. Demeuse and twenty-one professors, was founded in 1845 by the provincial council of Hainaut. The school, however, had shown only poor results up to its reorganization in 1865, when it was transformed into an industrial school proper, under the control of the commune, the province, and the state. Both on account of the large number of its pupils and the diversity of subjects taught, it is one of the most noteworthy schools of the kingdom. The courses in arithmetic, geometry, astronomy, topography, and steam engineering require two years' study; the other courses, one year. Instruction in physics, French, commerce, and drawing and modelling is given three evenings in the week; the remaining studies are pursued on Sunday. In either class the annual tuition fee is but 6 francs ($1.16).

Artisans compose the majority of the pupils. School excursions are often made, under the escort of professors, to the principal industrial establishments of the neighborhood; and large manufacturers and employers interested in the institution award special prizes to students who obtain the highest distinction. The number of pupils enrolled in 1889 was 934. The state and provincial subsidies amounted each to 10,000 francs ($1,930); that of the commune was 4,000 francs ($772).

Graduates of this school have organized a society known as the Association of the Alumni of the Industrial School of Charleroi (*Anciens Élèves Diplomés*), with the purpose of establishing friendly relations among its members and of maintaining, developing, and perfecting the knowledge acquired at the school, by conversations, conferences, and excursions, and by all other means calculated to promote this object. This society has over two hundred members, though founded so recently as 1889.

The following brief table shows the present occupation of 198 former students of this school:

OCCUPATIONS OF EX-STUDENTS OF THE INDUSTRIAL SCHOOL, CHARLEROI.

Occupation.	Number.	Occupation.	Number.
Accountants	9	Managers	2
Agents, commercial	2	Manufacturer	1
Architect	1	Markers	2
Blacksmiths	2	Merchants	8
Boss miners (*porion*)	13	Miners	7
Builders	2	Modellers	2
Cashier and bookkeeper	1	Moulders	2
Chemists	2	Physician	1
Clerks	60	Polisher	1
Directors, mining	4	Printer	1
Draughtsmen	7	Puddler	1
Druggist	1	Salesman, travelling	1
Electrician	1	Shoemakers	2
Engineer	1	Superintendents	9
Engineer, agricultural	1	Superintendent, bureau	1
Fish dealer	1	Superintendent, outside labor	1
Fitters	5	Superintendent, rolling mill	1
Foreman	1	Superintendents, workshops	4
Geometricians	10	Teacher	1
Glass cutters	3	Tracers	5
Hardware dealer	1	Turners	2
Head of establishment	1	Typographer	1
Inspector, state	1	Warden	1
Iron founders	2	Warehouse keepers	4
Joiners	4		
Leveller	1	Total	198

INDUSTRIAL SCHOOL, GHENT.

The Industrial School at Ghent, a superior technical school of great importance, was founded in 1828. The course was not well managed, however, and attendance declined. In 1834 the school was reorganized, and more than 400 pupils followed the instruction with enthusiasm.

The superintendents and the foremen of all the trades in Ghent at the time of the organization of this school came from England or from Germany. In 1834, according to Bertiaux, Ghent had not a single designer capable of making an intelligible drawing of a machine or of a mechanical or scientific appliance, even with a copy before him.

This last deficiency, so unfortunate for the further development of mechanical industry, was supplied by the intelligent foresight of Prof. Simonis, who had charge of the course of geometry; he made linear drawing an extension of that course, and, in connection with machine drawing, taught it to a class of 24 pupils in 1835.

The difficulty of addressing auditors, of whom a very large number could not understand French, led, in 1836, to the division of the course into two parts, viz., the French course, attended mostly by the sons of manufacturers; and the Flemish course, generally pursued by foremen and workmen of various occupations.

The different classes of the population pursuing the studies necessarily occasioned a notable difference in the methods of instruction; and so it came to pass that the French course assumed a scientific character, while the Flemish course was especially directed to practical ends. Scientific principles were fully demonstrated, but every demonstration was immediately followed by the chief applications of which the principle demonstrated was susceptible.

In 1856 the accidental explosion of a steam boiler led to the founding of a new course of mechanics, which was attended by more than 300 persons, the greater number of whom were charged with the care of steam boilers. The creation of a special diploma (*brevet de capacité*) gave a strong stimulus to the pupils of the new course, who by means of these diplomas secured advantageous positions in industry.

In 1852 a special school of industrial drawing and weaving was established, with a course parallel to that of the industrial school; but on reorganization in October 1860 the two departments were united under the name of an industrial school.

The curriculum of this school now includes the elements of algebra and geometry, descriptive geometry, linear drawing and its applications to mechanics and machinery, ornamental drawing, the elements of physics, elements of industrial mechanics, theory of steam motors, theoretical mechanics, with practical hand weaving and all the accessory operations for making plain and figured goods, the preparation of cotton, linen, and silk fabrics, etc.; chemistry, with special reference to its applications to local industries, such as sugar refining, distilling, soap manufacture, etc.; the chemistry of fibres and textile materials; bleaching, dyeing, etc.; industrial economy, elements of commercial accounts, theory and practice of photography, and the English and German languages.

The weaving course includes preliminary operations, such as winding, warping, beaming; harness for hand and power looms; the preparation of woofs, bobbins, dressing machines; mounting and fixing looms, from the old hand loom to the most complicated modern Jacquard; glossing fabrics; weaving damasks, dimities, brocades, silks, velvets. The drawing of all kinds of textiles is obligatory, showing patterns, picks, stripes, etc. Samples of stuffs to analyze and reproduce are assigned to the pupils, who soon grow proficient in the use of a variety of looms. Most of the graduates become superintendents or foremen in mills, or manufacturers on their own account.

The course of industrial drawing at the Ghent school is highly developed, effective, and largely attended.

From 1863 to 1868 young women were taught the use of the sewing machine, at a time when that invention was little known in Ghent. The lessons were of signal benefit, but were discontinued when machines became common possessions.

A fine collection of casts, a library, a laboratory, a well arranged weaving room, and a photograph gallery complete the equipment of the institution. The models and machines are of great service in exemplifying the principles of instruction.

During the school year 1890–'91 the total number of pupils was 1,645. The courses are entirely free, no tuition being charged in any department. Instruction is in both the French and Flemish languages.

The budget of 1890 amounted to nearly 60,000 francs ($11,580), subsidies from state, province, and city covering the expense. The highest salary paid to any member of the teaching staff, 3,500 francs ($675.50), is earned by the professor of painting and ornamental drawing. Next to this official the professor of chemistry receives the most, 2,888 francs ($557.38), and the professor of practical weaving comes next, with 2,800 francs ($540.40).

INDUSTRIAL SCHOOL, JEMMAPES.

The Industrial School at Jemmapes, a flourishing manufacturing centre near Mons, was instituted in 1880 by the commune and state, with the object of giving artisans of different occupations greater technical knowledge. The school has a three years' course. Drawing, mathematics, and mechanics are the principal branches taught. In 1889 there were 267 pupils. The state subsidy was 2,300 francs ($443.90), commune and province each paying 2,000 francs ($386).

INDUSTRIAL SCHOOL, LA LOUVIÈRE.

This institution, founded in 1888, under M. Berger and thirteen professors, has already made a name for itself. It possesses besides the usual departments a commercial section especially for accountants and commercial agents. In addition china painting is taught. The making of porcelain is an important pursuit in the town, and manufacturers in that and other industries give prizes for proficiency to the best pupils of the school. Established especially for workmen, its purpose is to impart the scientific knowledge requisite for the formation of good artisans, and to prepare them for worthily performing the functions of master workmen, overseers, and superintendents of trades and manufactures.

Fourteen years is the age of admission. Classes are held on Sundays and in the evenings, and are attended by many miners, as well as by men of other vocations. Drawing is obligatory in the second and third years. The programme includes arithmetic, French, geometry, commercial science, physics and mechanics, the care and management of steam engines, chemistry and metallurgy, civil and mining engineering, the chemistry and manufacture of glass, painting on glass and porcelain, industrial economy, hygiene, surveying, and modelling. Tuition is free to pupils living at La Louvière. Others pay 4 francs (77 cents) at the time of enrolment, unless they come from a commune that grants a subsidy to the school, in which case they are admitted on the same terms as the inhabitants of La Louvière. In 1889 there were 223 pupils enrolled. The state contributed 4,570 francs ($882.01), the province 2,000 francs ($386), the commune 4,225 francs ($815.43).

OCCUPATIONS OF GRADUATES OF THE INDUSTRIAL SCHOOL, LA LOU

Occupation.	Number.
Class of 1889.	
Clerk	1
Draughtsman	1
Letter-carrier	1
Miner	1
Stonecutter	1
	5
Class of 1890.	
Clerks	5
Draughtsmen	2
Fitters	2
Joiner	1
Machinist	1
Modeller	
Smith	
Class of 1891.	
Blacksmith	
Clerks	
Designer	
Draughtsman	
Fitter	
Glassmaker	
Miners	
Modeller	
Moulder	
Turners	

INDUSTRIAL SCHOOL, LIEGE.

The industrial supremacy of Liege attracts to the city ar every trade; and as early as 1825 a lawyer, M. Dormal, four industrial school, which from that time has advanced steadily and influence. From the first it was liberally supported by zens, by the Society of Emulation, and by the Society for the agement of Elementary Instruction. As early as 1828 a re made showing its remarkable progress. After various chang faculty and curriculum the school was reorganized in 1836, t tions of admission being made very severe. The present re date from 1860.

The first year's study embraces mathematics, geometry, a hand drawing. The second year calls for mechanics, physics, tive geometry, and the drawing of machines. In the third subjects are chemistry and metallurgy, engineering, hygiene, i economy, applied mechanics, steam engines and their care, an ing as applied to machines, iron work, stone cutting, and ca This work is specialized as follows: Industrial chemistry an lurgy; applied mechanics, steam; electricity; building and e ing; mining; firearms, comprising studies in the resistance rials, wood, castings, iron, steel, boring and drilling, and all cesses in the manufacture of ordnance. From October 1 t courses are held in the evening; six hours each week being de drawing, in three lessons of two hours each.

Liege is the centre not only of mines and enormous zinc works, but also of an immense firearms industry. The wea made in sections in the homes of the workers, both men an being employed. The pieces are then carried to the dealer, wh bles them, rejecting a piece for the slightest flaw.

At the industrial school 60 per cent. of the pupils are actual men. On leaving with diplomas students easily get lucrati

tions, being, in fact, much sought after; and a number have become prominent in various branches of manufacture. In 1889–'90 fifty-four diplomas and certificates were distributed to those completing the three years' course. Every year six travelling scholarships, worth 300 francs ($57.90) each, are awarded to the six best pupils by the communal government of Liege. These scholarships are conferred on condition that the holders make reports on the industrial establishments to which they are accredited as visitors. In January 1892 the number of enrolled pupils was about 700. The budget for 1889–'90 amounted to 32,524 francs ($6,277.13).

The following table shows the occupations of 148 of the graduates of this school:

OCCUPATIONS OF GRADUATES OF THE INDUSTRIAL SCHOOL, LIEGE.

Occupation.	Number.	Occupation.	Number.
Accountants	8	Inspector, coal mining	1
Architects	2	Joiners	3
Builder	1	Machinists	10
Business manager	1	Managers	2
Chemists	2	Manufacturers	4
Chief clerk	1	Merchants	2
Clerks	23	Mining engineers	3
Coachmaker	1	Modellers	2
Commission merchant	1	Moulder	1
Contractors	7	Mounter, machinery	1
Core makers	2	Plumbers	2
Designer	1	Professors	6
Director of public works	1	Receiver (of the commune)	1
Directors, coal mining	2	Road commissioner	1
Doctors of medicine	2	Sand moulder	1
Draughtsmen	28	Skilled workman	1
Druggists	2	Stonecutter	1
Electrician	1	Superintendents, manufactory	2
Engineers	2	Turners	2
Farmer	1	Woodworker	1
Geometricians	11		
Gunsmiths	6		148

INDUSTRIAL SCHOOL, LOUVAIN.

This institution was founded in 1876, and was installed in the same building with the Academy of Fine Arts, both being under the same management. The Central Belgian railroad contributes liberally to the support of the school, and the workmen in the extensive railroad shops of the city nearly all attend the classes.

The studies are of three years' duration, two years being spent in the preparatory department prior to entrance upon the regular course. In both six hours a week are devoted to drawing. In addition to the usual studies technology and technical drawing are taught, with mechanics, strength of materials, etc. The instruction is given in French and in Flemish. A polyglot course of commercial correspondence has been added, including French, German, English, Italian, and Spanish; and this teaching is of special value to all who look forward to a mercantile career. In this department alone there were 83 pupils in the school year 1891–'92, and in all departments 378 on the rolls.

The state and commune each paid a subsidy of 6,000 francs ($1,158); the province contributed 3,000 francs ($579).

In connection with this institution a milling school of immense technical significance and interest has been established. The course of instruction is most thorough and of genuine practical utility. It includes the following subjects:

The study of grains; the botany of grain bearing plants, their cultivation, the diseases peculiar to them, etc.; the structure of grains and their microscopic examination; the chemistry of grains; noxious insects; the chemistry of flour, meal, starch, etc.; the study of adulterations; bread making, the quality and analysis of bread; the application of physics to milling—water, steam, electric, and wind mills; transmission of power; different systems of milling, grinding, pulverizing, granulating, etc.; and drawing, with particular reference to apparatus useful in milling.

The object of this admirable school is to train capable workmen, master workmen, and overseers in the milling industry. In 1891–'92 fifteen pupils were taking this course.

INDUSTRIAL SCHOOL, MARCHIENNES AU PONT.

The commune of Marchiennes au Pont, near Charleroi, is relatively very populous, and it is the centre of many important industries; hence this industrial school has had a large attendance of pupils from its inception in 1873. The instruction embraces both general and special classes. The general course, lasting three years, comprises the French language, arithmetic, commerce, bookkeeping, algebra, geometry, and linear and industrial drawing. The special studies, covering two years, embrace hygiene, industrial economy, mechanics, industrial physics, metallurgy, and working of mines.

The course of industrial drawing is well organized and produces excellent results. The teaching staff consists of seven professors, most of whom are at the head of important industrial establishments. Many pupils from this school have obtained lucrative positions. Certificates of capacity are granted, after examination, to special as well as to general course students.

INDUSTRIAL SCHOOL, MORLANWELZ.

In 1871 a drawing and industrial school was opened at Morlanwelz at the suggestion of the mayor, M. Warocqué, owner of the important mines of Mariemont and Bascoup, and for years the financial mainstay of the new institution. The instruction comprises mathematics, commercial bookkeeping, elementary and applied physics, strength of materials, machine construction, technology, the management of steam engines, mining engineering, surveying and drawing.

The evening course requires five years for its completion, the Sun-

day section takes three years. The evening programme has also two subdivisions, viz., a preparatory course of three years and a two years' course of mechanical drawing. Three subdivisions exist also in the Sunday section, namely, mining, three years; mechanical engineering, three years; and drawing, duration unlimited. Nowhere in Belgium is free-hand sketching of machinery in place, and drawing machines from models, better done.

Tuition is free and pupils must be at least 14 years old to be eligible for matriculation. Certificates of capacity are awarded to such students as pass an examination in all subjects that enter into the programme of study. These certificates are of five grades. For obtaining the lowest degree the applicant must answer correctly more than 51 per cent. of the maximum number of questions; for the next higher more than 61 per cent. must be attained; for the third grade more than 71 per cent. is required; for the fourth, more than 81 per cent.; and for the highest grade more than 91 per cent. of the examination questions must be correctly answered.

The faculty includes 17 professors. In 1890 there were 170 pupils in the evening classes and 424 in the Sunday classes, a total of 594 students, some of whom were girls.

An association of pupils holding certificates from the Industrial School of Morlanwelz was founded July 19, 1885, and is prosperous, having 114 members in 1890.

INDUSTRIAL SCHOOL, OSTEND.

Founded March 12, 1866, and reorganized in 1888, this excellent school consists of two divisions, the industrial section and the section of fine arts. The studies in the former last three years, in the latter four years, both sections pursuing a common course during the first two years.

The special or applied classes comprise ornamental drawing, architecture, mechanics, and naval construction. Ostend being a shipbuilding centre and the seat of large government works for that purpose, much attention is paid to the subject of naval construction, with rigid preparation in drawing, geometry, and mechanics. In the government shops, where the director of the school holds a prominent position, workers are encouraged to attend the industrial classes; and most of the engineers and machinists in the mail and commercial service hold certificates from this institution. In the classroom both French and Flemish are used. The number of pupils is over 200.

INDUSTRIAL SCHOOL, SERAING.

The Industrial School at Seraing was founded in 1858 by the commune, with the aid of the province and the government, to educate young men to be designers and master workmen in metallurgy,

machine construction, and civil engineering. The Cockerill iron works and other large industrial establishments contribute liberally to the funds of this institution. The instruction comprises a general or preparatory course, and a more extensive special course of practical application to the products and manufactures of the neighborhood.

In the general course of three years are taught industrial drawing, arithmetic, algebra, geometry, physics, mechanics, chemistry, hygiene, and industrial and commercial economy, etc. In the special course instruction is given in chemistry and metallurgy, applied mechanics, civil engineering, practical electricity, industrial hygiene, and other subjects as the demand arises.

To serve as a preparation for the industrial school free evening classes have been opened, where the common branches, reading, writing, arithmetic, orthography, and drawing, may be followed. Pupils applying for admission to the industrial school must be 14 years of age or more, and must pass a rigid examination in these preparatory studies. The institution, so important from its local position in the heart of a dense manufacturing centre, lives up to its opportunities and keeps abreast with modern methods, lately improving and enlarging its curriculum to give greater prominence to drawing, electricity, and metallurgy.

The Cockerill iron works supports on its own premises a venture, unique of its kind in Belgium—a school for miners—composed of boys of 12, 13, and 14, who work all day in coal mines and are thus in danger of forgetting what they may have learned at school. To prevent this lapse into illiteracy and also to develop their intelligence and character, they are allowed to quit work early; and at 4 o'clock they repair to a school room where a teacher employed by the firm instructs them for two or three hours. The lessons are attended with great benefit; and it is to be hoped that this plan will be adopted by other employers of youthful labor.

INDUSTRIAL AND DRAWING SCHOOL, SOIGNIES.

The industrial and drawing schools at Soignies were united in 1859 and reorganized in 1878; and together they are now installed in a new building adapted to their purposes. In this joint school all the teaching is designed to bear upon local industries, especially on stone cutting and the survey, quarrying, and transportation of freestone, which is the chief source of revenue in this region. The studies cover five years and include arithmetic, commerce, geometry, projections and perspective, general physics and mechanics, architecture and civil engineering, economy, linear, relief, and industrial drawing, drawing from the antique, and architectural drawing.

The school is divided into three sections: A preparatory section of drawing, with related subjects, common to all pupils, two years; a section for drawing applied in the arts and industries; and an indus-

trial section, comprising several branches, each requiring three years' study.

In 1889 the number of pupils was 217, the state subsidy 3,000 francs ($579), the provincial 1,250 francs ($241.25), and the communal 1,500 francs ($289.50). Moreover, the large proprietors of quarries of the famous Belgian bluestone aid materially in supporting an institution patronized by nearly all their workmen.

INDUSTRIAL SCHOOL, VERVIERS.

The industrial school at Verviers was founded in 1862, resulting from the combination in one institution of the School of Workmen and Artisans and the special classes in weaving, established in 1857 by the chamber of commerce. Instruction includes arithmetic and elementary geometry, especially from the point of view of their application to industry; linear drawing as applied to machines and mechanics; elements of physics; elements of industrial mechanics; elements of chemistry, considered in their applications to local industries, especially dyeing; the various processes of weaving; classification, composition, and analysis of fabrics; the theory of colors; ornamental drawing and drawing from nature, the composition of ornament with a view to designs for prints, damasks, velvets, carpets, shawls, and all steps necessary for adapting these designs to the loom, making samples, etc.

The first year all pupils follow the same course—arithmetic, French, and free-hand drawing. At the beginning of the second year the studies subdivide into three specialities—weaving, dyeing, mechanics and engineering. All the classes are held in the evening except that in practical dyeing and hygiene, which meets on Sunday. On that day, also, practical instruction in darning fabrics, woollens especially, is given to young women, over a hundred of whom assemble in the Sunday morning classes. These girls are weavers, burlers, inspectors, and darners in the woollen mills, and tailoresses and dressmakers. The lessons are admirably thorough and practical, the mended places in fabrics being indistinguishable from new cloth, while pieces cut out completely are so skilfully restored as to deceive closest observers.

The weaving room is equipped with all appliances for thorough knowledge of the trade, and in both the theoretical and practical course analysis of stuffs is a specialty. Pupils completing the prescribed instruction are capable of reproducing any sample of woollen goods and telling all about it—how many threads there are in warp and woof, what numbers of yarn are used, what proportion of cotton and woollen there is, what mix and grade of materials, and how great is the strength of the requisite dyes. Most of the graduates have remunerative employment in the woollen mills of the town and province or with local and foreign cloth merchants.

In 1889 the number of enrolled pupils was 570; the state subsidy was 13,000 francs ($2,509); the provincial, 3,000 francs ($579); the communal, *8,000 francs ($1,544).*

DRAWING SCHOOLS.

The number of schools and academies of design in Belgium is remarkable. In 1889 there were 79 institutions of this character, with 13,134 pupils. In this list the Royal Academy of Fine Arts at Antwerp is not included. The academy, with its 1,294 students, is by no means exclusively for artists, for, as the classification of the pupils according to their professions shows, the largest number of any one trade were decorative painters (141), while professional artists numbered only 114, and carpenters, architects, engravers, tailors, machinists, moulders, jewellers, and artisans of other trades abounded.

The Belgians have always been keenly alive to the fact that it is far from sufficient to train mere designers for special fields of industry, but that appreciative knowledge of art principles must be diffused among the people in order to create a demand for good work and to stimulate artists and artisans to the highest standards. The mere wage earning value of art—notwithstanding that great stress is laid on it—is held to be secondary to the deeper significance of art in the life of a people; and in Belgium, true art is an ever-present, dominating idea, however much its universal application to industry may spring from commercial acumen.

It is, therefore, not surprising that the principal cities boast fine drawing schools conserving all the old and high traditions which are the pride of the people. To deal properly with art education in Belgium would require a separate treatise; and this report concerns itself only with the classes in industrial drawing existing in almost every school for drawing (*école de dessin*), and open both day and evening.

Women as well as men share all these advantages in art. At the Academy of Fine Arts in Brussels, as elsewhere, the young women do excellent work and carry off many prizes.

Night classes are most numerously patronized, and the attendance is enormous. At the Brussels academy colored objects as well as casts are much used as models, and alongside each model is a history or explanation of it printed in large letters, which the student is required to learn. The aim of all instruction is to develop the pupil's individuality, the master giving free rein to the student's interpretation instead of seeking to impose his own stamp. After the first year the courses are specialized according to the end to be gained. Attached to the academy is a superb museum of art curios, ancient and modern, freely drawn on for comparison between former and present artistic achievements, and used to stimulate the application of art to industry, thus inciting the emulation of the learner.

Besides its noble academy Brussels possesses three other great drawing schools under large staffs of able teachers, with instruction suited to every branch of high and applied art—in Molenbeek-Saint-Jean, Saint-Josse-Ten-Noode, and Ixelles, the three most progressive communes.

For the first year the instruction is of a general kind and followed by all who enter. Emerging from these preparatory classes the student is guided to some extent in his next step by his life work or trade. If he is or wants to be a mechanic, he turns to mechanical drawing; if a machinist, he draws models of machines; if a cabinetmaker, he adapts and originates furniture; if an architect, buildings of all kinds and art history occupy him; if a decorator, he remains longer in the elementary classes and pushes his studies further in the higher courses.

The secret of the success of these institutions is found in the circumstance that great artists and skilled artisans are secured to teach in the industrial and art schools.

The smallest group of students pursuing any technical study—as, for instance, four or five young men learning cabinetmaking, or as many would-be ornamental iron workers—get the instruction of a specialist, an eminent specialist at that, and are not compelled to fall back for teaching on the master of general drawing. The professor of mechanical drawing is more probably than not a successful engineer and bridge-builder. Over the modelling rooms one of the famous sculptors of the day will preside, whose mere presence is an inspiration.

Nearly every professor wears a government decoration for special attainments in some one line which is his main pursuit. The directors of these schools are, as a rule, of high repute in the world of art achievement.

At the Molenbeek-Saint-Jean school of design, in the poorest quarter of Brussels, attended by 600 pupils who are, almost without exception, workingmen and lads in blouse and wooden shoes, the small class in architectural drawing has been conducted for fifteen years by the architect who finished the famous law courts (*palais de justice*) when the man who designed and commenced the building died. This professor is now assisting the king's own architect in the restoration of the royal palace at Laeken, and will probably in time succeed that functionary, as he stands practically at the head of his profession.

The drawing school at Soignies employs professors from the Brussels academy; and in the Bok faience works at La Louvière the little drawing school for pottery decorators is taught by the same proficient masters. In the trade school for girls, rue du Marais, Brussels, the porcelain painting classes are conducted by one of the foremost artists in the city. Nor does the employment of these specialists interfere with the remarkably economical administration of the schools; for, so small are salaries as a rule in Belgium, and so overcrowded is every avenue to a remunerative livelihood, that capable men are not unwilling to give several hours a week for what Americans consider paltry pay. Besides, these teachers believe in thorough work; they are interested in education, and willing to advance the standards and achievements in art by personal participation in the drudgery of preparation essen-

tial to success. With men like Portaels and Baes at the head of the Brussels academy and painters of great worth and repute in charge of the drawing schools in almost every city, the supremacy of art in Belgium will not decline.

COMMERCIAL INSTITUTES.

The Commercial Institute (*L'Institut Supérieur de Commerce*) at Antwerp is the only one of its kind in Belgium. As its name implies, it is designed to fit pupils for commercial pursuits. The institute was opened in December 1853. The teaching staff consists of the director, professors, and the chief of the bureau of commerce with his assistants.

The course of instruction, which is both theoretical and practical, lasts two years. No subject of commercial importance is omitted from the plan of study. Attention is bestowed upon the minutest particulars, and the whole character of the teaching is practical as well as thorough.

During the first year five hours a week are devoted to banking, commercial accounts, bills of exchange, contracts, commercial insurance, correspondence in French, Dutch, English, and German, with special reference to buying and selling of merchandise, consignments, etc.

In the same year two hours a week are allotted to the study of the history of commercial products. This course is pursued with great advantage, as the collections in the museum connected with the institute are freely used to illustrate every branch of the subject.

The products of the mineral kingdom, for example, are first considered. In this connection arsenical preparations are studied; then phosphorus; carbon and its compounds, coke, anthracite and soft coal, animal charcoal, petroleum and its derivatives; iodine, bromine, mineral acids, etc.

Then metallic substances—potash, soda, magnesia, etc., with iron, zinc, lead, antimony, bismuth, mercury, silver, and their compounds, and gold, platinum, etc., are studied.

Vegetable products come next, and all commercial roots, barks, woods, bulbs, seeds, flowers, and fruits, together with textile fibres, such as cotton, hemp, flax, etc., are carefully and practically considered.

Political economy and statistics occupy two hours a week of the student's time throughout the first year. Under this head he is made acquainted with the object of political economy, concerning production, examination of the causes of the greater or less productivity in different places, concerning value, of money, of credit, of the equalization of production with consumption, of international commerce, of the forms of production, of the distribution of wealth, of the modes in which governments procure the necessary resources for the expenses of the public service, of statistics, their object, their use, their character, their divisions, etc.

Commercial and industrial geography receives attention for three hours a week during the first year of the course, including the topographical situation of the country, the nature of its soil, its mineral, vegetable, and animal resources; its political and social institutions, and their influence upon the prosperity of the place; the principal products of each locality; tables of exports; the principal products demanded in return by each place; imports; character of the economic legislation and customs duties of each place; obstacles and facilities to commerce; tastes and habits of the people in their relations to commerce; description in detail of the principal places of commerce, their importance, etc.

One hour a week, in the first year's course, is devoted to the principles of commercial law. Three hours a week are likewise consumed in the study of the German language; especially is the terminology of the principal articles of commerce thoroughly familiarized. Commercial correspondence and conversation in German are encouraged; while, at the same time, the commerce of Germany, the customs duties, the laws, the boards of trade, the banks, and the chambers of commerce are fully investigated. Three hours a week are also devoted to English studies of a similar kind. The Dutch language receives the same attention. This course is obligatory for all Belgian pupils. Optional Spanish and Italian lessons are also provided.

In the second year the same studies are pursued further, and with the like painstaking thoroughness. Such training raises commercial pursuits to the rank and dignity of the learned professions.

At the end of the second year of study the pupils are examined by a committee composed of seven members named by the government, and receive the diploma of licentiate in commercial science.

The institute has a well selected library of about 5,000 volumes, comprising works on law, political economy, statistics, accounts, chemistry, history, geography, literature, etc., of various countries. There is also a chemical laboratory where pupils are taught analysis, and especially commercial analysis (as to strength, purity, adulterations, etc.).

The museum of the institute is provided with an abundance of specimens and collections of great value for purposes of instruction; and the government aids essentially in the formation of such collections by instructing its diplomatic agents and consuls to keep this object in view.

The annual expenses of the institute amount to 85,000 francs ($16,405). The receipts consist of a state subsidy, 45,000 francs ($8,685); a city subsidy, 15,000 francs ($2,895); tuition fees, 25,000 francs ($4,825). According to Bertiaux the attendance from 1853 to 1889 was 3,879. Of this number 2,255 were Belgians and 1,624 foreigners.

During the existence of the school 398 Belgian ex-students have become heads (*les chefs*), or assistants in banks or commercial houses.

Of these 184 are bearers of the diploma of licentiate of com science. These pupils are distributed among the following occup

OCCUPATIONS OF EX-STUDENTS OF THE COMMERCIAL INSTITUTE, ANT

Occupation.	Number.	Occupation.
Bank directors, agents, etc	155	Consuls general
Chiefs or associates of commercial houses	213	Professors and teachers
Consuls	8	Vice-consuls

SCHOOLS OF INDUSTRY AND MINES.

Connected with the university of Liege is a school of mines repute; but as a type of this branch of higher technical educat institution at Mons may be briefly described. The degree of e from this establishment is greatly valued.

As long ago as the year 1836 it was proposed by M. Thorn, g of the province of Hainaut, to establish a technical sch teaching subjects appropriate to the different industrial prof The school was opened at Mons, November 1, 1837. At fi course of instruction was of two years' duration, but in the year 1876–'77 the curriculum was enlarged, and the course was ened to four years.

Still the actual organization of the School of Mines and Indus not perfected until October 1887, when the institution ku *L'École d'Industrie et des Mines* was established at Mons, the ca the province.

Fourteen professors and five instructors are on the teachin The course includes the specialties of mining, metallurgy, in chemistry, mechanics, locomotive, civil, and electrical engi At the beginning of the fourth year each pupil is allowed tc what specialty he will adopt; until that period the studies an tical work are the same for all students.

The annual tuition fee is 120 francs ($23.16). At entrance must be at least 16 years of age, and pass an examination in geography, history, arithmetic, algebra, geometry, and trigono

The school at Mons possesses a library, laboratories, and coll and is well equipped for its work, especially in the department trical engineering.

The expenses for the year 1890 amounted to 62,450 francs ($12, The state subsidy for the year was 20,043 francs ($3,868.30), t vincial subsidy was 27,087 francs ($5,227.79), the city of Mons was 9,320 francs ($1,798.76). The average attendance at th school is 80 pupils a year.

CHAPTER IV.

PRESENT STATUS OF INDUSTRIAL EDUCATION IN FRANCE.

CHAPTER IV.

PRESENT STATUS OF INDUSTRIAL EDUCATION IN FRANCE.

THE PUBLIC SCHOOL SYSTEM.

Public school education in France began practically in 1833. In that year the distinguished statesman, Guizot, organized primary instruction, dividing it into two grades, called respectively elementary and advanced. The lower division, the elementary, included moral and civic instruction, reading, writing, the elements of French grammar and of arithmetic, and the legal system of weights and measures. In the advanced grades, in addition to these subjects, pupils were to be taught the elements of geometry and its usual applications, mechanical drawing, surveying, some practical notions of the physical and natural sciences, singing, the elements of history and geography in general, and particularly the history and geography of France.

The advanced primary schools did not have the success which was hoped for them, for reasons which it would serve no particular purpose to outline here, so that in 1850 they were legislated out of existence. In 1881 they were revived, and, since 1886 particularly, they have undergone a marked development. Curiously enough their suppression served to show the great gulf which existed between primary and higher education. It also marked the period of attempts to span it, in a measure, by so-called technical trade schools.

The system of public education in France has been entirely remodelled in the last decade. The law of June 16, 1881, made primary education absolutely free. The law of March 28, 1882, rendered attendance at school compulsory for children between the ages of 6 and 13 years, and gave to instruction a purely secular character. The law of October 30, 1886, definitely organized primary education in its various grades and confided it exclusively to the laity. In accordance with the terms of this enactment primary instruction covers the following classes of schools:

Infant schools (known popularly as kindergartens).

Elementary primary schools.

Advanced primary schools (*a*) and supplementary courses in connection with elementary primary schools (*b*).

Schools of manual apprenticeship, as defined by the law of December 11, 1880.

---

[a] The advanced primary school (*école primaire supérieure*) in France corresponds very nearly to the American high school. Scholars enter at 13 years of age, after having graduated from the elementary primary school, and remain until 16 or 17.

[b] In certain towns or villages where a small number of pupils wish to proceed with the higher primary instruction after having graduated from the elementary courses, instead of building up a new advanced primary school the instruction is given in courses annexed to the elementary primary schools and called *cours complémentaires*.

INFANT SCHOOLS.

The so-called infant school (*école maternelle*) or, to transla mother school, is really not a school in the strict meaning o It is designed to create a pleasant and imperceptible passa home to the school, imitating the affection and indulgence o while at the same time initiating the pupil into school wor larity. Less attention is paid to teaching the child a m than to the development of its different faculties without f straint, or excess of application. He is taught to love the early to acquire a taste for work.

Below will be found in detail the programme of studies c fant schools. The manual exercises are of the simplest sor are, in a measure, an introduction to the more advanced trai elementary primary schools.

There are two grades in the infant schools, an infantile c children between the ages of 2 and 5 years, and an advanced those from 5 to 6. Both sexes are received, but in the element vanced primary grades boys and girls are taught in separat

The following is the official programme of courses of st infant schools:

COURSE OF STUDY IN THE INFANT SCHOOLS.

	Children from 2 to 5 years.	Children from 5 to
First principles of moral education.	Care taken of the children in order to teach them good habits, to gain their affection, and to cause them to maintain good relations the one with the other.—First notions of good and evil.	Simple conversations int class exercises and re poems explained and lea Relation of moral tales, fo tions to make sure that th derstood the point.—So attention given to those c the teacher has noticed so springing up.
Exercises in language.	Pronunciation.—Exercises having for aim the augmentation of the vocabulary of the child.—Little memory exercises (songs, fables, tales); questioning.	Combined exercises of spec writing, preparatory to c Oral exercises; familiar q for object to teach child themselves clearly; corre pronunciation and local acc exercises; recitation of s Written exercises; dicta single word, then of two c short phrases.—4. Reading which are listened to and pupils.
Object lessons. Information about common objects. First notions of natural history. Illustrations on charts.	Names of the principal parts of the human body; of the principal animals of the region; of nutritious plants and those most constantly seen, as trees and familiar flowers.—Name and usage of objects serving for clothing or used in the house, for eating and at labor.—Study of colors and combinations at play.—Notions in regard to day and night.—Observations upon periods of time (a day, week).—The names of day, evening before, and the morrow.—Age of the child.—The attention of the child is called to the differences between heat and cold, between rainy and fine weather.—Observations upon the seasons, their influences and products.—First lessons in the education of the senses.—The child is taught to select and compare colors, shades, forms, lengths, weights, temperatures, sounds, odors, and flavors.	Elementary notions in regar body; talks on hygien study of animals, plants, st the child knows.—Disti plants used for nourishme ployed industrially.—Ston ordinary usage.—The air steam, cloud, rain, snov object lessons, with the selves either before the hands of the children.—Fa tions with the object of t elementary facts (the rigl names of days and months; distinction between the an and mineral kingdoms), es them to observe, compare remember.

COURSE OF STUDY IN THE INFANT SCHOOLS—Concluded.

	Children from 2 to 5 years.	Children from 5 to 6 years.
Drawing, writing, and reading.	Making cubes, balls, etc., as play mosaics.—Explanation of simple pictures (animals and common objects).—Making combinations of lines with small sticks.—Representation upon the slate of these combinations; description of common objects. No exercises in reading, properly called.	Combinations of lines.—Representation of these combinations on the slate or paper in ordinary crayon or in colors.—Small original designs upon checkered paper.—Reproduction of easy drawings made by the teacher.—Representation of the most simple and usual objects.—First exercises in reading.—First elements of writing letters, syllables, and words.
Arithmetic.	Familiarize the child with the terms one, two, three, four, five, one-half; counting up to 10. Mental calculation with the first ten numbers.	First elements of oral and written enumeration.—Simple exercises in mental arithmetic.—Addition, and subtraction, up to 100.—Study of the first ten numbers, and of the expressions half, third, quarter.—The four operations with numbers of two figures.—The metre, the franc, the litre.
Geography.	Domicile and address of parents; name of the commune; simple exercises in relation to distance.—Relative situation of different parts of the school.—Land and water.—The sun (its rising and setting).	Familiar conversations and simple preparatory exercises, serving particularly to evoke a habit of observation in the children by causing them simply to remark the most casual phenomena and the various configurations of the territory.
History and tales.	.....	Anecdotes, tales, biographies, drawn from the nation's history, accounts of voyages, etc., illustrated by pictures.
Singing.	Simple singing in unison.—Simple exercises.—Playing and marching.—Evolutions and drilling.—Attention to sanitary matters and cleanliness.	Singing in unison in two parts, learned exclusively by ear.—Play, marching, drill, etc.
Manual exercises.	Play.—Simple exercises in folding, weaving, and plaiting.	Folding, weaving, plaiting, making combinations on paper or canvas with different colored woollen yarns.—Simple knitting.

An inspection of the manual work done by children in an infant school at Armentières, in the north of France, shows that sound ideas of elementary manual training there prevail. One hour a day is the time usually allotted to this kind of work. The children seem to take the greatest interest in what they do.

The programme of courses of study as outlined in the preceding pages is very closely followed in all the infant schools of France.

Charitable, quite as much as pedagogical, considerations influenced the original creation of infant schools. Now they are recognized as a most useful preparation to primary education, and the attention paid to the moral discipline and mental and manual instruction of the child predominates over the charitable idea.

The latest statistics available for the infant schools in connection with the public educational system of France are for the academic year 1886–'87. At that time there were 3,597 establishments giving instruction to 543,839 pupils.

ELEMENTARY PRIMARY SCHOOLS.

The elementary primary school represents the intermediate stage in the public educational system. The child enters usually at 6 and remains until 13 years of age. There are four grades in these schools, viz., for children between the ages of 5 and 7, 7 and 9, 9 and 11, and 11 and 13.

The official programme of courses of study includes instruction in

the following subjects: Hygiene and cleanliness; ethical training; gymnastic and military exercises; reading; penmanship; French language; history; geography; civic instruction; arithmetic; geometry; elements of physical and natural science; agriculture and horticulture; and singing. The official programme is followed almost uniformly and with only slight variation throughout the country.

We give in detail so much of the official programme as relates in any way to manual training.

COURSE OF STUDY IN THE ELEMENTARY PRIMARY SCHOOLS.

	Children from 5 to 7 years.	Children from 7 to 9 years.	Children from 9 to 11 years.	Children from 11 to 13 years.
Manual training for boys.	Simple exercises in braiding, folding, and weaving.—Cutting and applying pieces of colored paper to geometrical designs.—Small basket work.—Combinations of colored wool on canvas or paper.	Exercises for developing the skilful use of the hands.—Cutting pasteboard cards in shapes of geometrical solids.—Basket weaving: combining twigs of different colors.—Modelling: reproduction of geometrical solids and very simple objects.	Construction of covered pasteboard objects, with designs of colored paper.—Simple iron wire work: trellis work.—Combining iron wire and wood work: cages.—Modelling: simple architectural ornaments.—Conception of the use of ordinary tools.	Combined exerc[illegible] of designing [illegible] modelling: ske[illegible] ing objects to be [illegible] ecuted, and [illegible] structing obje[illegible] after the sketch [illegible] or *vice ver*[illegible] Study of the p[illegible] cipal tools used [illegible] wood work.—Pr[illegible] tical exercise[illegible] Planing, sawi[illegible] and simple jo[illegible] ing.—Nailed bo[illegible] and joining wi[illegible] out nails.—Wo[illegible] turning—very si[illegible] ple objects.—Stu[illegible] of the princip[illegible] tools used in ir[illegible] work. — Exercis[illegible] in filing, smoot[illegible] ing, or finishing [illegible] rough objects fro[illegible] the forge or fou[illegible] dery.
Manual training for girls.	Small exercises of the Froebel system: weaving, folding, braiding.—Simple works in knitting.	Knitting and stitching: knitting to the right and reverse, sides, increasing and decreasing.—Cross-stitching on canvas.—Elements of sewing: hems and whip-stitches.—Manual exercises for developing the skilful use of the hands; cutting and arranging pieces of colored paper.—Little tasks of modelling.	Knitting and darning.—Cross-stitching on canvas.—Elements of sewing: the running stitch, backstitch, side-stitch, whip-stitch, plain sewing, hems, seams, whip-stitching edges, plaiting.—Perfecting simple, easy needlework (towels, napkins, handkerchiefs, aprons, covers), piecing, mending.	Knitting shirts [illegible] vests, gloves.—Stitching o[illegible] cloth. — Quilts [illegible] plaits, buttonholes [illegible] mending garments [illegible] darning. — Knowledge of cutting and [illegible] finishing simple [illegible] garments.—Knowledge of simple domestic economy and kitchen work, washing and repairing linens, the needs of the household, the garden, and poultry yard.—Practical exercises at the school and at home.
Ornamental drawing.	Combinations of lines: representation of these combinations on the slate, with a pencil on paper, or with touches of colors; small designs of invention on checkered paper; reproducing very simple designs made by the teacher.—Representing very simple common objects.	Sketching straight lines and dividing them into equal parts; estimating the relations between the lines; drawing and estimating angles.—First principles of ornamental designs.—Circumferences, regular polygons, rosettes, and stars.	Free-hand drawing.—Ordinary geometrical curves: ellipses, spirals, etc.—Curves applied to the vegetable kingdom: stems, leaves, and flowers.—Copy of casts representing ornaments in slight relief.—Geometrical representations of lines and perspective, with plain lines then with shadows—geomet-	First notions of geometrical drawing and elements of perspective.—free-hand drawing.—Drawing of purely geometrical ornaments from print or from relief: mouldings, egg-shaped ornaments, ogees, beads, dentils, etc.—Drawing from print or from relief ornaments whose elements are taken from the

COURSE OF STUDY IN THE ELEMENTARY PRIMARY SCHOOLS—Concluded.

	Children from 5 to 7 years.	Children from 7 to 9 years.	Children from 9 to 11 years.	Children from 11 to 13 years.
			rical solids and ordinary simple objects.—Geometrical drawing.—Employment on the board of instruments for drawing straight lines and circumferences: rulers, compasses, squares, and protractors.—This will be limited only to a knowledge of the use of those instruments which he will require in the higher course.	vegetable kingdom: leaves, flowers, fruit, palms, foliage, etc.—Elementary notions of the orders of architecture illustrated on the blackboard by the teacher (3 lessons). — Drawing of the human head: its parts and proportions.—Geometrical drawing.—Execution on paper by means of instruments, the geometrical figures which in the previous course had been made on the blackboard.— Principles of coloring with even tints.—Reproducing designs of plane surface and light relief decorations: panels, church windows, tiling, inlaid flooring, ceilings; finishing some of these with India ink and coloring.—Representation by means of geometrical lines of geometrical solids and of simple objects such as framework, and pieces of carpentering, exterior stone dressing, iron work, most ordinary furniture, etc.; employment of colors for indicating the nature of the materials. — Coloring plans and charts.

Manual training commences where the pupil left off with it in the infant school, and is continued throughout the whole four grades of the elementary primary establishment. The instruction outlined for the highest division—for pupils from 11 to 13 years of age—would naturally call for workshops. Unfortunately these are not always forthcoming, as only a comparatively few communities have been public-spirited enough to provide them (*a*). It is unfortunate, especially in view of the fact that many children having completed their period of compulsory education, are drafted off by their parents into situations without having a chance to pass through the advanced primary school. A two years' course of workshop manual training, such as is prescribed by the official programme, would be of immense service to those who take up industrial occupations. No doubt students of this age are too

a In France the communes must supply the land and erect the school buildings, which always remain local property. The state pays the salaries of the teachers.

young to receive conspicuous profit in connection with any particular trade, but the knowledge of how to use tools, the dexterity of the eye, and suppleness of the hand, the ability to fashion even the simplest object after a drawing, would serve them well no matter what they did in after life.

Manual training in this grade of schools is being considered more and more a necessary complement to a sound general education rather than as a practical end. As this view becomes more widely understood, municipalities hitherto deterred by ignorance or indifference will make adequate provision for following out the official programme in its entirety. It is perhaps unfortunate that the courses of study are already so heavy that the only time left for the workshop is from half-past five to seven in the evening.

Generally speaking, the manual training courses for boys comprise two groups. The one consists in exercises destined in a general way to unloose the fingers and to teach them dexterity, agility, rapidity, and accuracy of movement; the other, graduated lessons in modelling, serving to complement corresponding studies in mechanical drawing, and particularly designing in connection with industry. For the girls, besides cutting and sewing, a certain number of lessons and amount of advice are given not only upon domestic economy, but on *morale*, with a view of inspiring a love of order and a taste for housekeeping and to hinder the acquisiton of frivolous and dangerous ideas.

From the infant schools to the advanced primary schools the following materials are utilized in the manual training courses: Straw, willow shoots, paper, thin cardboard, twine, wire, sheet iron, wood, iron, zinc, copper, modelling clay, pottery clay, plaster, chalk, and sandstone.

Manual training means from the beginning to the end a technical daily lesson, the theory of the immediate work to be performed being particularly emphasized. It means, also, free-hand and mechanical drawing, the sketching of common articles of manufacture and of their separate parts in plans, cross-sections, and elevations according to scale.

MANUAL TRAINING IN ELEMENTARY PRIMARY SCHOOLS FOR BOYS, PARIS.

In 1873 M. Salicis, until his death general inspector of manual training for France, conceived the idea of introducing manual training in the elementary primary schools. Workshops were then constructed in connection with the boys' school in the rue Tournefort, forming a sort of annex. The city has ever since given 16,000 francs ($3,088) annually to pay for the necessary materials as well as the force of workmen teachers engaged to give the instruction.

Contrary to the general practice which admits only pupils from 11 to 13 years of age to the workshops, the children enter here at 8. All do mechanical drawing and model work.

In order to have more time for the shop the students of the higher division (from 11 to 13 years) spend an hour longer each day at school. This division passes three hours daily in the workshops, and is divided into five sections, each of which spends one week alternately at carpentry and wood turning, metal turning, forging and fitting, modelling and moulding, and wood and stone carving.

The children in the class immediately below (9 to 11 years) spend one hour daily in the shop, working alternately on wood and iron. Modelling is done in a special class.

The youngest boys (8 years of age) devote two hours per week to the shop, working also alternately upon wood and iron, and the same length of time in modelling. The implements used by them are simply the rasp, the file, and the saw.

A primary school teacher who has himself been instructed in manual training during his course at the normal school is in charge of the workshops. Under him are placed five skilled workmen, a carpenter and joiner, a wood turner, a metal turner, a blacksmith, and a fitter, who direct the practical efforts of the pupils.

This institution is unique amongst schools of a similar grade in Paris. It was not accepted as a model for the rest, when in 1880 manual training was introduced more generally. The commission having charge of the matter decided not to make, as it were, elementary trade schools, but to provide manual exercises in the workshop for the most advanced division only and to give to the instruction the character of a sort of gymnastics for the eye and the hand.

These views are embodied in the programme of studies already given and now in force. It seems probable, however, that another change will soon be made, for the whole subject has been recently carefully and thoroughly studied by a commission of experts at the head of which is M. Duplan, the subdirector of primary instruction for Paris. The principles adopted can not fail to have great weight coming from such high authorities. They are as follows:

1. Manual training in schools should be considered as a means of general education. It is besides an indirect preparation for the exercise of different occupations because it teaches the method of handling tools.

2. Manual training should be above everything else methodical; it should comprise gradations and synthetic exercises. In order to encourage personal effort, competitions should be organized every two months between the more capable scholars. The greatest liberty should be allowed in the execution of the task imposed by the instructor.

3. Drawing being the base of manual training no object should be made without a full sized drawing of it having first been made by the student. The pupils should be familiarized with the use of scales, cross-sections, and perspectives.

4. Manual training should be obligatory to all pupils.

5. Instruction should be given in the class room and in the workshop.

6. Modelling and the study and sketching of tools in general use should be exacted of all students, as well as for the younger ones other exercises, such as paper box making, folding, cutting, basket work, etc.

7. Only scholars in the advanced division (11 to 13 years of age) and of the intermediate class (9 to 11 years) should go to the workshop. However, if circumstances permit, one might also admit those of a younger grade on trial.

8. Instruction in manual training should be given during regular class hours.

9. The following amount of time should be given up weekly to manual training in the different classes of public schools. Infant schools, six hours. Elementary primary schools, nine hours, of which five should be accorded to manual training proper, and four to drawing and modelling. Advanced primary schools, three hours in the first year and two hours each in the second, third, and fourth year classes to manual training proper, and one hour in each of the four classes to modelling.

10. Instruction in manual training should be given by a regular teacher assisted by skilled workmen chosen by competitive examination. The latter should be taken for one year on trial.

11. One general programme should be prepared and be divided into three parts, viz., for the infant schools, elementary primary schools, and advanced primary schools, respectively, so as to insure harmony, uniformity, and gradual development.

12. The manual exercises should always be preceded by theoretical and technical lessons on the subject in hand. The length of these latter should never exceed a quarter of the regular period.

13. In order to reduce as much as possible the expense of the materials necessary for the prosecution of the work the exercises should be so graduated as to allow the greatest economy in the use of wood and iron.

14. The workmen instructors being chosen by competitive examination, should be properly remunerated and allowed to improve their situation.

15. In order to make primary teachers competent to direct instruction in manual training they should be assigned for certain periods of time to the school in the rue Tournefort for observation and practice.

In Paris at the present time workshops for the prosecution of manual training exist in one hundred and one boys' elementary primary schools, or fully one-fourth of the whole number for France attached to this grade of schools.

Below is given a table showing the number of lessons and hours each week given to the different subjects taught in the elementary primary schools of Paris:

COURSE OF STUDY IN ELEMENTARY PRIMARY SCHOOLS, PARIS.

Subject.	7 to 9 years.		9 to 11 years.				11 to 13 years.			
			Boys.		Girls.		Boys.		Girls.	
	Lessons per week.	Hours per week.	Lessons per week.	Hours per week.	Lessons per week.	Hours per week.	Lessons per week.	Hours per week.	Lessons per week.	Hours per week.
Moral and civic instruction	3	1½	5	2½	5	2½	5	2½	4	2
Reading and recitation	14	7	3	3	4	4	3	1½	2	1½
Writing	10	5	5	2½	5	2½	2	1¼	2	1¼
Drawing	2	1¼								
Drawing, art							2	4	2	4
Drawing, mechanical			2	1½	2	1½	1	1	1	¾
Arithmetic, elementary	5	2½								
Arithmetic and metric system.	3	¾	5	5	5	5	5	5	5	5
Grammar	5	1¼								
Dictation	5	2½								
French language			5	5	5	5	5	5	5	5
History	(a)	(a)	2	1½	2	1½	2	1½	2	1½
Geography	a 5	a 2½	2	1½	2	1½	2	1½	2	1½
Physical and natural science			3	2¼	2	1½	1	1	1	¾
Object lessons	2	1								
Hygiene, domestic economy.									1	¾
Manual training	b 2	b 1¼	2	1¾			2	3½		
Sewing	c 2	c 1¼			1	1¼			1	1¼
Cutting and dressmaking									1	2½
Singing	2	1	1	1	1	¾	2	2	2	2
Gymnastics	5	2½	5	2½	5	2½	3	1½	5	2½
Military exercises							2	4		
Recreation periods	10	2½	10	2½	10	2½	8	2	10	2½
Total	73	32½	50	32½	49	32½	45	37½	46	35

a History and geography taught in combination.
b For boys only.
c For girls only.

MANUAL TRAINING IN ELEMENTARY PRIMARY SCHOOLS FOR BOYS, LILLE.

After Paris, Lille has perhaps done the most of all French cities for the development of manual training in purely primary schools. There are nine workshops, in seven of which wood and metal work is carried on, modelling in plaster in another, while the ninth is devoted to bookbinding and paper box making. Four hundred and seventy-one pupils, between the ages of 10 and 13, receive instruction in the shops during four hours weekly.

The original cost of the equipment of all the workshops was about 30,000 francs ($5,790). Each shop is provided with ten carpenters' tables, ten benches for metal work, and four forge furnaces and anvils, so that sections of twenty-eight boys may work at one time. The annual cost of maintenance, which includes the salaries of the special teachers as well as the cost of materials used, is 15,200 francs ($2,933.60).

The instructing force consists of an overseer (*surveillant*) who is one of the regular teachers of the school and who has himself passed through a course of manual training in the normal school, a first-class carpenter and joiner who can also do wood turning, and a skilful mechanic who understands fitting, metal turning, and forging. The overseer occupies himself with the elucidation of drawings, theoretical explana-

tions, and the supervision of the conduct of the boys. The workmen teachers are charged simply with the direction of all practical work. They are paid 500 francs ($96.50) each per year for eight hours of presence weekly (except during the holidays) in the workshops.

The system of instruction followed is quite interesting. It is the creation of Prof. C. Codron, who is the technical director of the workshops attached to the Industrial Institute of Lille, as well as the supervisor of the manual training department of the public schools.

Prof. Codron carefully designates the work to be done in the different years and even the order in which it is to be executed. He then makes on a sheet of paper a series of drawings, showing the plan, elevation, and a cross-section of the object to be executed. Dimensions are also given. In a note below he sets forth first the usage to which the object is put and then detailed practical directions in regard to its execution. These sheets are posted conspicuously on the walls of the workshops. On brackets immediately beside them are the actual objects themselves, which have been previously made by pupils and now serve as models.

The students in the drawing class draw in their workshop notebooks the objects they are expected to make. In the shop itself, with the sketch, the sheets, and a model before them, they are in the best possible position to learn how to translate a drawing into a material object of utility. This of course is the prime consideration in a skilful mechanic. It is safe to say that whoever can do this well will never want for work. Boys can be taught to do it in school, and in so learning they enhance wonderfully their material prospects in life. The period of apprenticeship is materially shortened for a carpenter, machinist, or fitter to about six months. At the end of that time the boy of 13½ years of age becomes what is known in France as a half-workman and earns 1 franc (19 cents) at least per day.

The instruction in manual training is given after school hours, from half-past 5 to half-past 7, four days in the week. The classes are divided into two sections, one of which works in the wood and the other in the metal workshop. In the month of March the sections change places, the metal workers going to the wood workshop and *vice versa*. Students, therefore, are neither fitters nor carpenters when they graduate, but they know something of both occupations. More than this, they have learned the use of intelligence in its application to hand labor.

A kind of museum is established in each school in which the best made objects are kept on exhibition, with the name of the student workman perpetually attached.

MANUAL TRAINING IN ELEMENTARY PRIMARY SCHOOLS FOR GIRLS, PARIS.

The municipal authorities of Paris have for more than twenty years paid particular attention to the development of manual training in connection with the education of girls. Since 1867 instruction in sew-

ing has formed a part of the regular programme of elementary primary schools. The progression of exercises is as follows:

In all the classes the articles necessary for an exercise in sewing—cloth, canvas, needles, and thread—must be prepared before the time set apart for the lesson.

Instruction in sewing must never be individual. It must be given orally and simultaneously to the whole class, and the theorems must always be elucidated by figures on the blackboard.

Each pupil, being provided with the necessary articles, must do the work in accordance with the method outlined.

At the end of each month the pupil must do some original work. This is properly examined and classified.

The work required of girls in the different classes is specified below in detail.

INSTRUCTION IN SEWING.

1. Course for girls between 7 and 9 years of age.

Marking: Simple stitch, cross-stitch on canvas; exercise in Roman letters.

Sewing: Running stitch, whip-stitch, side-stitch.

Application: Simple sewing, whipping, hemming.

The employment of canvas in this course is of great utility, not only for the study of cross-stitching, but for plain sewing as well. It permits putting in the hands of the children the blunted points, which preclude all idea of danger, and it accustoms them little by little to a suppleness of the fingers very necessary in sewing.

Cotton thread dyed is used, as this makes work more attractive in the eyes of the children and renders defective workmanship more readily visible.

As soon as the study of the first stitches is finished the child sews on a piece of cotton cloth without having had it made ready for her.

The attention of the child is evoked by the attractiveness of this new field of labor.

One lesson of 1½ hours is given each week.

2. Course for girls between 9 and 11 years of age.

Marking: Roman letters, italics, initials upon coarse cloth.

Sewing: Running stitch, side-stitch, whip-stitch, backstich, making buttonholes.

Application: Whipping, simple sewing, turning in seams, hemstitching, making buttonholes.

Mending: Putting a patch in the corner with a whip-stitch.

Both white and colored threads are used, as also cotton cloth or linen in small pieces, without being prepared.

The buttonhole *stitch is first* taught before cutting the cloth.

All scholars must do the same work. The teacher must watch that everything is done in the same fashion after a typical piece which serves as a pattern and has been prepared before the class.

During the first quarter each scholar makes a workbasket for herself, marks it with her name, and keeps in it her needle, thread, thimble, and scissors.

One lesson of 1¾ hours is given each week.

3. Course for girls between 11 and 13 years of age.

Marking: Roman letters, italics, initials on fine linen or cotton cloth.

Sewing: Recapitulation of the different stitches studied in the two preceding courses; exercise in herring-bone stitching.

Application: Buttonhole making, joining, eyelets, seam-stitching on the bias, seam-stitching in quilting, seam-stitching zigzag, gathering.

Mending: A square piece, whip-stitched and backstitched; a triangular piece in the same manner; darning and repiecing stockings.

Both white and colored thread are used as well as long and short needles. The pieces of cloth on which the work is done are put away in the scholar's workbasket, which she is obliged to prepare during the first quarter.

Mending, a most important thing in housekeeping, holds a conspicuous place in the programme.

One lesson of 1¼ hours is given each week.

INSTRUCTION IN CUTTING, BASTING, AND MAKING UP.

Instruction in cutting, basting, and making up was first organized in 1877 in the seventh and ninth *arrondissements* (*a*) as an annexed course to the girls elementary primary schools. During 1878 a general course of instruction and application was created in each municipal subdivision of Paris, which was given for three hours every Thursday. In the following year, 1879, it was decided that henceforth this important branch of education should form an integral part of the regular courses of study in all of the elementary primary and advanced primary schools of the city.

In order to make the teachers efficient to direct the work two courses of normal instruction were opened on Thursdays (the weekly holiday in the French schools), which teachers were invited to follow. As a special inducement a supplemental salary was awarded to all those who received the certificate of aptitude after having successfully completed the course. Practically all now possess the certificate.

The following programme, uniformly followed, gives in detail an outline of the work required in connection with cutting, basting, and making up:

---

a A municipal division equal in area to perhaps three or four wards in American cities.

Course for girls between 11 and 13 years of age.

All the pupils must learn to take measures. The teacher picks out two scholars at a time; the first takes the measure of the second and *vice versa*. The measurements are written on the blackboard and scrupulously verified by the teacher. The attention of the students is called to the precautions necessary when the measure is taken on clothes which already fit badly.

A manikin may be employed for a theoretical demonstration, but never in the practical, since the figures which represent the measurements of the manikin are soon learned by heart, and hence teach nothing.

The measurements duly verified and corrected are left inscribed on a part of the blackboard. The teacher assigns one of the class in regular order to design on the other part of the blackboard the pattern in accordance with the given measurements. The whole class copies this—the more advanced portion on paper, the other on slates—using always life-size proportions. The teacher walks around during the exercise indicating mistakes, and after the exercise examines carefully and marks the work done. In this manner the first hour and a half of the period is occupied.

Then the scholars under the direction of the teacher place their patterns on the cloth and learn how to cut out and baste the parts together. This done, the sewing and complete making up follow. Dresses, jackets, aprons, baby linen, etc., are the objects made.

These subjects form part of the examination required for graduation from the elementary primary schools. Within a certain limit of time, at this examination, each pupil must trace a pattern of a basque in its proper dimensions, then cut it out in cloth, and baste the parts properly together.

Two and a half hours per week are given to instruction in this course.

The educational administration of Paris has thus defined the aim of these courses of study and application:

The instruction should aim at only useful ends and every exercise which is not of practical utility should be avoided. Our courses in the elementary primary schools ought not to endeavor to form workers specially trained in any particular branch of work. To do this is the mission of the trade school. The sole purpose of the instruction given should be to prepare scholars to become in later life good housekeepers and mothers of families. Therefore, as the programme shows, the work done is that which is of constant utility in the home circle, such as mending clothes, darning stockings, making linen, adapting cast off clothing of large children for younger ones, etc.

INSTRUCTION IN HYGIENE AND DOMESTIC ECONOMY.

This course of study, while purely theoretical and given orally, is an important adjunct to manual training. In certain of the advanced primary schools of Paris kitchens and laundries are attached for pur-

poses of practical and manual demonstration, but there are none of these annexes to any of the establishments in the particular grade we are now considering.

While the oral instruction is going on the pupils have their needlework in their hands and partially occupy themselves with sewing. This accustoms them to listen, and work with their fingers at the same time—a situation in which the practical housewife is very often placed. This course occupies three-quarters of an hour per week.

Course for girls between 11 and 13 years of age.

FIRST TERM.

Hygiene: Definition of hygiene. Hygiene of the dwelling. Choice of a house, sanitary requirements, ventilation. Care of the house and furniture from the sanitary point of view.

Domestic economy: Definition of domestic economy. Duties of the mistress of the house. Qualities requisite in a good housekeeper—order, economy, cleanliness, vigilance. Budget of receipts, expenses, with daily account keeping. Inventory of the furniture. Rent and taxes. Conditions of renting a house; the lease and notice to leave.

SECOND TERM.

Hygiene: Heating and lighting from the hygienic standpoint. Ventilation of rooms provided with heating appliances. Dangers of having stoves in sleeping rooms; necessary precautions. Properties of different kinds of fuel and their influence upon the respiratory organs. Different modes of lighting. Precautions necessary with oil lamps, gas, etc. Influence of light on the vision. Hygiene of the sight.

Domestic economy: Choice and care of furniture. Distribution of housekeepers' work. Cleaning to be done daily, weekly, and in certain seasons. Advice upon the best way to make beds, sweep, and dust. Cooking utensils. Different forms of stoves and ovens. Lighting fires. Cleaning and lighting of lamps. Care of cooking utensils and dishes. Fuel, economic indications upon the different sorts, their proper employment. The cellar, care to be taken of wine, provisions, and general keeping in order.

THIRD TERM.

Hygiene: Hygiene in relation to clothing. Properties of different kinds of cloth, silk, woollen, cotton, linen, etc. Influence of color in relation to clothing. Style of clothing from the hygienic standpoint. Cleanliness of clothing and underclothing; its influence upon the health.

Domestic economy: Choice and care of clothing and underclothing. Materials necessary for all kinds of sewing. The employment of sew-

ing machines. Making of clothing and underclothing. Patching and darning. Laundry work, materials used in this branch. Lye and soap washing. Instructions on the washing, folding, and ironing of linen. Different kinds of soil spots and the best way to remove them.

MANUAL TRAINING IN ELEMENTARY PRIMARY SCHOOLS FOR GIRLS, LILLE.

Instruction in manual training in this grade of girls' schools at Lille does not differ materially from the system in vogue at Paris. In all of the twenty-one of these schools three and three-quarters hours are devoted weekly to instruction in sewing to picked members of the two highest classes, *i. e.*, pupils from 9 to 13 years of age. There are in addition six courses of cutting and dressmaking, which are held from 10 to 12 o'clock every Thursday morning. Ten to fifteen chosen pupils from each school attend. The municipality makes an appropriation of 1,200 francs ($231.60) annually to defray the cost of these special courses. Students after completing them find themselves in a position to earn 1 or 2 francs (19 or 39 cents) per week immediately on leaving school. In three months' time they are paid 50 centimes (10 cents) a day and at 16 years of age they gain easily 2 francs (39 cents) per day. At 25 years of age they are often comfortably established in businesses of their own.

Every Thursday evening, from 7.30 to 9.30, two courses in cutting and dressmaking are given to those students who have left school before having completed their studies in order to enter situations found for them by their parents. Forty-seven are now availing themselves of the privilege. The municipality bears the expenses, which amount to 900 francs ($173.70) a year.

ADVANCED PRIMARY SCHOOLS.

The official programme of courses of study in this grade of schools is given in detail in the following pages.

The distribution of classes and the amount of time accorded to each study has not been officially regulated. An inspection of the distribution of classes in such advanced primary schools as Lille, Roubaix, and Tourcoing will fairly indicate the prevailing conditions. At Roubaix, for example, an exceedingly well equipped advanced primary school exists. The city is, moreover, a great industrial centre. In this school the time per week alloted to manual training is as follows: Fourth year class, five and one-half hours; third year class, four hours; second year class, two and one-half hours; first year class, three and one-half hours. This is, however, above the average.

Workshops had, up to the year 1889, been provided for 207 of the 503 schools and supplementary courses of this grade.

official programme of courses of study in the advanced p
ls of France includes instruction in the following subjects:
nmanship; French language and elements of literature; history;
graphy; civic instruction and political economy; arithmetic; alge-
; geometry; surveying; bookkeeping; elements of physics; chem-
ry; natural sciences; hygiene; agriculture and horticulture; modern
nguages; electrical instruction; singing; gymnastic and military ex-
cises.

We give in detail so much of the official programme as relates in any
way to manual training.

COURSE OF STUDY IN THE ADVANCED PRIMARY SCHOOLS.

Drawing for boys and girls.

Continuation of the exercises of the elementary schools, and application of the
following programmes:

Free-hand drawing: Drawing of purely geometrical objects, from copy and relief;
mouldings, ovals, heart-shaped ornaments, beads, dentils, etc.

Drawing from copy and relief: Ornaments whose elements are taken from the
vegetable kingdom; leaves, flowers, fruits, palms, foliage, etc.

Exercises in designing from memory.

Elementary notions of the orders of architecture given on the blackboard by the
teacher (three lessons).

Drawing of the human head: Its parts and proportions.

Geometrical drawing: Execution on paper, with the aid of instruments, the geo
metrical figures which in the previous schools had been made on the blackboard.

Principles of coloring with even tints.

Reproducing designs of plane surfaces and of light reliefs: Panels, church windo
tiling, inlaid flooring, ceilings. Some of those to be finished with India ink
coloring.

Representations of geometrical solids and other simple objects, such as framew
pieces of carpentry, exterior stone dressing, iron work, most common pieces of
ture, etc., by means of geometrical lines. Employing of colors for indicatin
nature of the materials. Coloring plans and charts.

Geometrical drawing for boys.

Plane geometrical figures. Executing, to a certain scale, from a side s
plane surface decoration (tiling, inlaid flooring, borders, church windows)
ing with even tints, the different parts, either to conform to the sketch,
bine the colors in such a way as to obtain a satisfactory decorative effect.
tion. Executing, to a scale to be determined, from a side sketch,
jection (plan), and of a vertical projection (elevatio
this solid parallel to the plans of projection
le, after a side sketch
solids w

occupy on the picture, the point of view, and the height above the ground; also the dimensions to be given on the perspective picture.

Parts of machinery and plans of buildings. Execution on a given scale, after a sketch, the drawing of the parts of a machine, or the plan of a building.

Ornamental designing for boys and girls.

The proofs of ornamental drawings are always taken from models in relief.

The material conditions of acceptance, and the rules for the correction of drawings, are determined by the ministerial circular of May 1, 1883, relative to the examination of drawings by the superior commission.

Manual training for boys.

A. WOOD WORK.

Principal woods employed in the constructions and in machinery; qualities and uses.

Principal tools employed in wood work.

Various kinds of exercises in sawing, boring, planing, turning, and joining.

B. IRON WORK.

Properties, varieties, qualities, and uses of iron; principal tools usually employed in iron work.

Work with the file, the hammer, and forging, soldering, chiselling, boring, turning, putting together, and adjusting.

Sketching objects in iron or wood to be executed, and their construction after the sketch.

Manual training for girls.

HOUSE WORK.

The dwelling: furniture, care of the furniture.

Food: arrangement of the kitchen; utensils, cleaning.

Supplies: water, bread, milk, lard, butter, oil, cheese, sugar, coffee, etc.; choice and qualities of meats; various modes of cutting meats; boiled beef, soups, fryings, roasts.

Elementary principles of cooking.

Poultry, game, fish, eggs.

Vegetables: nutritive qualities; cutting, conserving.

Fruits: nutritive qualities and conservation; preparation of jams.

Drinks: wine, cider, beer, vinegar, alcohol, liquors, fruits preserved in brandy.

Heating: wood, coal, coke, charcoal; prices and heating power of various fuels.

Heating apparatus: fire places, stoves, hot air furnaces.

Lighting: vegetable and mineral oils, candles, gas, various kinds of lamps.

Washing: lye washing of linens by the old and the new methods; potash, soda, soap, chlorides.

Scouring: effects of grease, of acids, of alkalies, of mud, of ink, of paint, etc.

Ironing.

Clothing: qualities of the various tissues; their imitations; preserving woollens goods and furs during the summer; hygiene of clothing.

NEEDLEWORK.

First year.—Review of the elements included in the work of the primary school in order to equalize and perfect the work already done.

Various kinds of stitches; hemming, whip-stitch, flattened seams, gathering, crocheting, knitting.

Simple darning; knitted darning.

mming handkerchiefs, serviettes, linen cloths.
attened seams in men's shirts, and womens' and childrens' chemises.
essons in dressmaking: childrens' stays, corset covers, caps, bibs, bedding, babies'
es or swaddling clothes; young girls' chemises.
Lessons in cutting and fitting: corsets, childrens' stays, corset covers, bibs, bed-
ng, babies' robes or swaddling clothes; young girls' chemises.
Second year.—Review of the various stitches used in sewing: running stitch, back-
titch, quilting, hemstitch, whip-stitch.
Buttonholes and connecting threads.
Needle embroidery; feather-stitch.
Marking embroidery without models: initials, gothic and fancy lettering.
First lessons on the sewing machine: simple work.
Lessons in dressmaking: mens' shirts, womens' and childrens' chemises; womens'
and girls' drawers; flannel undervests; womens' skirts.
Lessons in cutting and fitting: waists, flannel undervests, womens' skirts, dresses;
three or four models of simple robes taken from existing fashions.
Instructions in the manner of taking measures, taking orders, and fitting the
clothes.
Third year.—Mending different garments; darning, various kinds of stuffs; darning
holes.
Trimming womens' hats.
Working the sewing machine.
Cleaning and repairing.
Lessons in dressmaking: linens for women and girls, with trimmings; laces and
embroidery; chemises, chemisettes, undervests, dressing jackets, drawers, gowns,
corset covers, bonnets, collars, cuffs, etc.
Dresses with and without trimmings.
Summer clothes for women.
Exercises in cutting: clothing for little boys and girls; aprons, blouses, jacke
boys' trousers, drawers, robes, cloaks.

The table which is given below shows the occupations followed
students leaving (either as graduates or without having completed
full course of study) the advanced primary schools for boys in Fr
during the years 1884, 1887, and 1890. The number of schools r
sented in the table is 537.

OCCUPATIONS OF EX-STUDENTS OF ADVANCED PRIMARY SCHOOLS FOR
FRANCE.

Occupation.	1884.		1887.		18
	Number.	Per cent.	Number.	Per cent.	Number.
	250	3.46	568	5.29	57
...strial or technical schools	1,205	11.90	2,468	23.00	3,7
...ly tech-			176	1.64	2,
			[illegible]	21.25	1

The inference to be drawn from the foregoing official statistics is the very satisfactory one that pupils who have either wholly or in part completed the courses of study in the advanced primary schools (about the same grade as the American high school) are more and more taking up purely industrial occupations for a livelihood. The effect of manual training which has been steadily developing during the last ten years has been to augment the proportion from 11.90 per cent. in 1884 and 23 per cent. in 1887 to 29.39 per cent. in 1890.

The figures just quoted refer to the whole 537 boys' advanced primary schools of France in operation on December 31, 1890. Of this number 34 have placed themselves under the operation of the law of December 11, 1880, *i. e.*, make a specialty of trade or technical training in response to the particular industrial needs of the region where they are situated. It was officially ascertained that 46.46 per cent. of the students graduating or quitting these schools during the year 1890, either passed on to technical schools of a higher grade or entered purely industrial occupations in a technical capacity. No statistics have as yet been compiled for girls' schools of this grade.

It would be both interesting and instructive to give a detailed account of many of the excellent advanced primary schools where manual training is carried on, such as at Paris, Lille, Roubaix, Tourcoing, Rouen, and other places. But space forbids indulgence in this regard, and information relating to one or two typical ones only can be presented.

MANUAL TRAINING IN ADVANCED PRIMARY SCHOOLS FOR BOYS, PARIS.

Every school of this grade in Paris has a workshop attached for manual work in wood and iron.

The tasks assigned are practically those prescribed in the official programme of courses of study already given in detail in the preceding pages. Two hours weekly are assigned to workshop instruction in manual training in each of the three years of the course of study and two hours per week each to geometrical and to free-hand drawing.

In the first year's class there is a special section composed of candidates for admission to the national schools of arts and trades at Aix, Angers, and Châlons. This section devotes ten hours instead of two hours weekly to workshop training. During the twelve years, 1878 to 1889, exactly 200 students from the advanced primary schools of Paris secured admission to the national schools of arts and trades, while 89 were admitted to the still higher Central School of Arts and Manufactures.

In the third year a separation takes place into commercial and industrial sections.

We give below the number of hours per week assigned to each of the prescribed subjects of study in the advanced primary schools for boys at Paris.

COURSE OF STUDY IN ADVANCED PRIMARY SCHOOLS FOR BOYS, PARIS.

Subject.	Hours per week.				
	First year.		Second year.	Third year.	
	Regular course.	Candidates for national schools of arts and trades.	All students.	Industrial course.	Commercial course.
Manual training	2	10	2	2	2
Drawing, free-hand	2	2	2	2	2
Drawing, mechanical	2	2	2	2	2
Mathematics	5	10	5	5	4
Physics and chemistry	1	.....	3	4	3
Natural history	2	.....	1	1	1
Applied mechanics	.....	.....	.....	1	.....
Industrial economics	.....	.....	.....	1	1
French language and literature	4	4	3	4	4
Foreign languages	5	.....	4	2	4
History	2	2	2	2	2
Geography	2	1	1	1	2
Legislation	.....	.....	1	1	1
Bookkeeping	1	.....	2	1	2
Penmanship	1	1	1	.....	1
Moral and civic instruction	1	.....	1	1	1
Singing	1½	.....	1½	1½	1
Gymnastics and military exercises	5	.....	3	3	3
Total	36½	32	34½	34½	36

The table given below shows the occupations followed by ex-students of the advanced primary schools for boys at Paris. The figures of the table cover the years 1878 to 1889.

OCCUPATIONS OF EX-STUDENTS OF ADVANCED PRIMARY SCHOOLS FOR BOYS, PARIS.

Occupation.	Number.	Per cent.
Students, technical schools of higher grade	539	[illegible]
Technical employés in industrial establishments	1,999	21.56
Technical employés in government service	46	[illegible]
Commercial pursuits	4,630	49.93
Non-technical employés in government service	150	1.62
Army and miscellaneous occupations	158	1.70
Students, other schools, non-technical	712	7.69
Deceased	48	[illegible]
Unknown	1,579	17.02
Total	9,277	100.00

It is interesting to note the large number of these boys who have entered technical vocations of some kind. Of the whole number shown above, 9,277 boys, 2,584 or 27.86 per cent. appear in this class. This includes students in higher technical schools as well as those employed in technical positions either in industrial establishments or in government service.

MANUAL TRAINING IN THE ADVANCED PRIMARY SCHOOL FOR BOYS (INSTITUTE TURGOT), ROUBAIX.

This school was founded in 1880, and the manual training feature was added in 1885 by the city of Roubaix. The school prepares boys for the national schools of arts and trades or for commercial or industrial [illegible]. The course of instruction covers four years.

The instruction in theoretical branches is that prescribed by the state for advanced primary schools, more attention, however, being given to mathematics, drawing, and mechanics. The manual work is in wood and iron, one-half the time being devoted to each during the first and second years. During the third and fourth years pupils work entirely at wood or at iron. The work done consists of useful articles such as patterns for machines (made of wood) mouldings, vises, tools, drilling machines, etc., and carpentry. The workshop for metal work has three drilling machines, seven lathes, one double forge, three grindstones, twenty vises, and twenty work benches; each pupil has one hammer, six files, one rule, one squaring rule, one rim square, one chisel, and one punch. The workshop for wood work has twenty work benches and each pupil has one large plane, one jack-plane, and one ordinary plane, two saws, one chisel, and one hammer. In the daily work the foremen may teach the pupils by taking the tools in hand and showing them how to do certain parts, but in work done for examinations only the pupils themselves are permitted to touch the tools.

The following table shows the course of study with the time given to each branch, and hence outlines the relative importance of manual training in comparison with other branches. The school hours are from 8 a. m. to 12 m., and from 2 to 7 p. m. with an intermission from 5 to 5.30 p. m. From 5.30 to 7 p. m. most of the time is given over to study, but there are classes in singing and German besides the studies of the table below, and manual training work. On Thursday afternoon there is no school session.

COURSE OF STUDY IN THE INSTITUTE TURGOT, ROUBAIX.

Subject.	Hours per week.			
	First year.	Second year.	Third year.	Fourth year.
Accounting	1	1	1	1
Agriculture	.....	.....	.....	1
Algebra	.....	1	1	1
Arithmetic	2	3	2	2
Chemistry	1	1	1	1
Composition	.....	.....	.....	1
Dictation	3	3	3	1
Drawing, linear	2	2	2	2
Drawing, ornamental	.....	.....	.....	2
English	3	4	3	4
Ethics	1	1	1	1
French	.....	1	.....	1
Geography	1	1	1	2
Geometry	3	3	3	3
Grammar	1	1	1	1
Gymnastics	1	1	1	1
History	2	2	1	3
Literature	1	1	2	.....
Manual training	3½	2½	4	5½
Natural history	1	1	1	1
Ornament	1	1	1	.....
Physics	.....	1	1	1
Reading	1	1	1	1
Recitation	2	1	1	1
Study	13	11	12½	2
Style	1	1	1	.....
Writing	2	1	1	1
Total	46½	46½	46½	40½

The attendance at this school in 1891 was: First year's class, 77; second year's class, 67; third year's class, 52; fourth year's class, 32; total, 228 pupils.

The pupils who leave the school enter upon commercial and industrial pursuits—mostly the former. They belong generally to the better element of the middle class (*bourgeois*). The pay which ex-pupils get, either as apprenticed workingmen or as clerks, etc., averages about 25 francs ($4.83) per month for such as have attended the school one year, 40 francs ($7.72) for those having attended two years, 50 to 60 francs ($9.65 to $11.58) for those having attended three years. Those who finish the course earn about 75 francs ($14.48) per month upon leaving the school. About 15 per cent. of the graduates continue their instruction at the National School of Industrial Arts at Roubaix.

The instruction is gratuitous. Forty boarders are received, who pay 500 francs ($96.50) annually for board. Admission is by competitive examination. Candidates must be at least 12 years old and must have a certificate of primary education.

Following is the annual budget of this school:

Expenses paid by the city of Roubaix:	
Indemnity for residence of the director and five professors (*a*)	$926.40
Pay of two teachers of manual training	463.20
Five indemnities for lodgings (*a*)	463.20
Janitor	212.30
Furnishings for laboratory and shops	501.80
Prizes	154.40
Furnishings for class instruction	38.60
Five overseers (during study hours)	386.00
One teacher of mechanical drawing	154.40
One teacher of German language	154.40
One teacher of English language	308.80
One teacher of singing	115.80
Various indemnities and sundries	96.50
Expenses paid by the state:	
Salary of director	579.00
Salaries of five professors at 2,000 francs each	1,930.00
Total annual expenses	6,484.80

The brief table which is given below shows the occupations of 604 ex-students of the Institute Turgot, covering the period from 1880 to 1890:

OCCUPATIONS OF EX-STUDENTS OF THE INSTITUTE TURGOT.

Year.	Industrial pursuits.		Commercial pursuits.		Higher technical schools.		Other schools.		Government service.		Total.	
	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.
1880	1	9.1	10	90.9	.....	.....	.....	.....	.....	.....	11	100
1881	2	16.6	9	75.0	1	8.4	.....	.....	.....	.....	12	100
1882	6	37.5	5	31.2	3	18.8	2	12.5	.....	.....	16	100
1883	8	27.6	7	24.1	5	17.3	7	24.1	2	6.9	29	100
1884	17	31.4	21	38.9	7	13.0	7	13.0	2	3.7	54	100
1885	25	31.6	36	45.6	4	5.1	11	13.9	3	3.8	79	100
1886	22	29.7	33	44.6	5	6.8	13	17.6	1	1.3	74	100
1887	27	38.0	32	45.1	7	9.9	5	7.0	.....	.....	71	100
1888	30	38.5	31	39.7	8	10.3	7	9.0	2	2.5	78	100
1889	36	45.0	29	36.2	9	11.8	6	7.5	.....	.....	80	100
1890	46	46.0	34	34.0	13	13.0	7	7.0	.....	.....	100	100

a In lieu of rent.

It will be noticed that during the eleven years for which the statistics are available there has been a marked advance in the proportion of those who have either passed on to some technical school of higher grade or have entered directly into some industrial calling, viz., from none and 9.1 per cent. respectively in 1880, to 13 per cent. and 46 per cent. in 1890. Only one-third instead of the great bulk of the students now connect themselves with commerce. If these figures show anything, they prove that manual training is becoming increasingly influential in giving a technical bent to the mind.

MANUAL TRAINING IN ADVANCED PRIMARY SCHOOLS FOR BOYS, TOURCOING, ROUEN, AND LILLE.

The conditions of admission, programme of courses, and character of workshop training at Tourcoing, Rouen, and Lille do not differ materially from those at Paris and Roubaix. A statistical statement of what has become of ex-students from the advanced primary schools in the two first named cities may not be without interest.

OCCUPATIONS OF EX-STUDENTS OF THE ADVANCED PRIMARY SCHOOL FOR BOYS (INSTITUTE COLBERT), TOURCOING.

Occupation.	1887-'88.	1888-'89.	1889-'90.	1890-'91.
Apprentices and workmen	14	11	11	13
Industrial pursuits	1	1	1	2
Agricultural pursuits	1	1	1	.....
Commercial pursuits	1	.....	.....	1
Office employés, industrial establishments	5	3	3	7
Office employés, commercial establishments	6	6	6	10
Employés, government service	.....	1	1	2
Students, higher schools	1	2	2	4
Student, military school	1	.....	.....	.....
Architect	.....	.....	.....	1
Total	30	25	25	39

OCCUPATIONS OF EX-STUDENTS OF THE ADVANCED PRIMARY SCHOOL FOR BOYS, ROUEN.

Occupation.	Number.	Occupation.	Number.
Students, national schools of arts and trades.	48	Commercial establishments	171
Students, national school of agriculture at Grignon.	2	Various branches of industry	179
Students, veterinary school at Alfort	3	Agricultural pursuits	15
Students, school for engineers of the navy.	3	Students, normal schools	6
Government service	26	Obtained diplomas	59
Banks and architects' offices	57	Obtained certificates of education	18
		Total	587

MANUAL TRAINING IN ADVANCED PRIMARY SCHOOLS FOR GIRLS, PARIS.

The programme of studies as officially outlined in the preceding pages is practically followed, except that in some schools more attention is paid to manual training than in others. The domestic economy features, too, stand in the same category.

Especially is the instruction in practical cooking but little followed out. The physical limitations are such that a pupil is able to undertake practical exercises only two or three times a term, and of course much can not be expected in the way of results.

The time allotted to instruction in manual training is two hours weekly throughout the first three years and six hours weekly throughout the fourth year of the course.

Manual training in these schools does not in anywise partake of the nature of an apprenticeship to any particular occupation. It is meant to teach students how to cut and sew their own dresses without pretending to make of them dressmakers. It teaches them how to make their own hats without making milliners of them. Such exercises are a part, and an essential part, of the general education of young girls, since it prepares them for the rôle of good housekeepers and mothers of families. Beyond this result nothing is sought.

MANUAL TRAINING IN ADVANCED PRIMARY SCHOOL FOR GIRLS, LILLE.

The industrial features of instruction were introduced in 1872, when classes in sewing were opened. Painting on porcelain and cloth was inaugurated in 1881. The school had previously occupied itself only with advanced primary studies.

The object of the school is to make girls proficient in such work as is appropriate to their sex, in addition to giving an advanced primary education.

The course of instruction is for four years. The first three years have two classes each, and the fourth has three classes. The intellectual work is the same as prescribed by law for advanced primary schools. Sewing is obligatory for all pupils; painting is optional. Embroidery and industrial design for cloths was introduced in 1892.

The following table shows the number of hours per week devoted to each study:

COURSE OF STUDY IN THE ADVANCED PRIMARY SCHOOL FOR GIRLS, LILLE.

Subject.	Hours per week.			
	First year.	Second year.	Third year.	Fourth year.
Ethics	2	2½	4	
French literature, language, and reading	14	22	13	
History	6	9	6	
Geography	4	7	4	
Pedagogics				
Mathematics	8	12	8	
Physical, industrial, and chemical sciences	6	10	10	
Domestic economy (theoretical)				
Bookkeeping			2	
English and German languages	6	6	6	
Geometrical drawing	4	6	2	
Painting				
Cutting and sewing garments	6	6	4	
Music	2	2	2	
Gymnastics	1	2	1	
Penmanship	2	2	2	
Ornamental drawing	2	3	4	

Special classes are given Mondays and Saturdays for girls who have left the school but wish to receive additional instruction in perfecting garments. These classes are occupied six hours per week.

Very few graduates seek positions in the industries—about 30 per year—and these leave school mostly at the end of the second year. Of the graduates about 40 per year become school teachers, there being no normal school here.

The instruction is gratuitous and the conditions for admission are the same as for other advanced primary schools. The attendance was 330 pupils in 1891.

MANUAL APPRENTICESHIP SCHOOLS.

There is a class of institutions in France known as manual apprenticeship schools. They are a kind of public elementary trade school. In point of general instruction they are of the same grade as the advanced primary schools, but less attention is paid to purely intellectual than to workshop training. The latter is usually made to conform in character to the industrial needs of the region.

Previous to 1880 public technical training lacked completely in organization. Certain municipalities, like Paris, Havre, and Reims, alive to the importance of this branch of education, had founded apprenticeship schools or annexed technical courses to their advanced primary institutions. In other cases private or industrial associations had done the same thing.

The law of December 11, 1880, assimilated all these institutions and brought them under the joint control of the minister of public instruction and the minister of commerce and industry. It afforded also an opportunity for departments or municipalities wishing to provide the proper workshops and pay the necessary instructors to change the character of their advanced primary schools to apprenticeship schools; in other words, to pass from a system of purely intellectual instruction, or mental with a modicum of manual training, to an elementary trade education, preparing the student for the exercise of some manual occupation.

Up to the present time about fifty schools have taken advantage of this law, which is now to be further modified by eliminating entirely the control of the minister of public instruction and leaving them solely under the jurisdiction of the minister of commerce and industry. Thus they are likely to become more purely trade schools than they are at present.

M. Félix Martel, in an interesting monograph, has set forth lucidly, in parallel columns, the chief points of difference between advanced primary and manual apprenticeship schools. It must always be borne in mind that the advanced primary schools and municipal manual ap-

prenticeship schools are of practically the same grade as the high school. The following is a condensed translation:

ADVANCED PRIMARY SCHOOLS.

1. Creation of school.

By the decision of the council for the department (*a*) upon the approval of the minister of public instruction.

2. Instructors.

The directors and the professors are chosen by the minister of public instruction alone; the assistant and special teachers by the prefect of the department.

3. Admission of students.

Must have previously graduated from an elementary primary school.

* * *

5. Instruction.

At least eighteen hours per week must be given up to literary and scientific instruction.

6. Inspection.

Inspection under the direction of the minister of public instruction.

7. Board of supervisors.

A board of supervisors whose duty it is to look after the management of the school, to find places for graduates, to see that the programme of studies best

MANUAL APPRENTICESHIP

1. Creation of scho

By the decision of the co
department approved by th
public instruction, who mus
have secured the assent of
of commerce and industry.

2. Instructors.

The director is chosen by
of public instruction, with t
of the minister of commerce a
from a list of three names s
the municipal council if t
founded by a municipality,
partmental council if foun
partment. The professors
teachers are appointed joi
minister of public instruct
minister of commerce and in
The workshop instructor
by the mayor if the school i
by the prefect if department

3. Admission of stud

Must be at least 12 years ol
dates have not graduated fro
tary primary school, they mu
of age and pass an examin
alent to that required fo
from an elementary primary

* *

5. Instruction.

Ten hours weekly at most
corded to intellectual instr
bulk of the time is devot
shop training and to instruc
nology and science, in its a
industry.

6. Inspection.

Same as in advanced pri
and in addition the inspector
education from the minis
merce and industry for the
technological branches.

7. Board of supervis

To appoint the physician f
prepare the budget, apport
of class instruction amongst
teachers, present to the may

a The department in France may be roughly compared with the c
United States.

responds to local needs, scholarships, etc., is appointed by the minister of public instruction upon the advice of the regional inspector.

a list of three candidates from which to choose a workshop instructor, to prepare for ministerial sanction a programme of special studies, and in general to watch over the material interests of the school.

This board is composed of one representative each of the ministers of public instruction and of commerce and industry, and if the school is departmental the prefect as president, two members of the council of the department, and three men chosen from amongst the prominent manufacturers or merchants of the region. If the school is municipal, same as above, except that the mayor replaces the prefect as president.

8. Subsidies.

Solely, as far as the government is concerned, accorded by the minister of public instruction.

8. Subsidies.

Subsidies accorded by both the minister of public instruction and the minister of commerce and industry; only none of the appropriation from the minister of public instruction can be applied to pay the expenses of boarding pupils, or the salaries of workshop instructors or of anything which has to do with apprenticeship training. These are at the charge of the minister of commerce and industry. Furthermore, the subsidy from this latter source may be applied in any manner agreed upon in any covenant made with the municipalities concerned.

9. Scholarships.

Conferred with the sanction of the minister of public instruction by the prefect upon the advice of the local inspector and departmental council.

9. Scholarships.

Joint nomination of the two ministers, with the advice of the local inspector and departmental council.

The minister of commerce and industry may also give special scholarships (usually for residence abroad) out of his budget.

The table given below presents the official programme of the course of study in the manual apprenticeship schools of France. These schools are all regulated by the law of December 11, 1880.

COURSE OF STUDY IN MANUAL APPRENTICESHIP SCHOOLS.

Subject.	Hours per day.		
	First year.	Second year.	Third year.
Mental instruction as given in the advanced primary schools	2	2	2
Drawing	1	1	1
Manual training	3	4	5
Scientific and technological instruction, especially in its application to industry.	1	1	1
Total	7	8	9

MANUAL APPRENTICESHIP SCHOOLS, PARIS.

This class of institutions, as has been already remarked, represents strictly neither manual training nor trade schools, though leaning somewhat toward the latter.

In Paris there are four principal ones for boys and six for girls, supported by the municipality, and administered largely by a supervising board appointed by the municipal council and the ministers of public instruction and of commerce and industry.

These schools pursue distinctly the aim of shortening the period of apprenticeship by allowing the pupil to choose, either upon entering or at the end of the first year, the specific occupation he expects to pursue in after life. In the boys' schools the period allowed for general instruction is four hours in the first two, and three hours in the third year daily; in the girls' schools three hours daily. The boys spend four hours and a half daily in the workshops during the first two years and six hours and a half during the third; the girls five hours daily in all the years.

The general instruction covers the most necessary subjects prescribed in the advanced primary schools. For the boys it comprises the French language and literature, mathematics, applied mechanics, technology, physics, chemistry, history, geography, ornamental and mechanical drawing, and bookkeeping; for the girls, ethical and civic training, French language and literature, arithmetic, science in its application to commerce and industry, history and geography, ornamental and free-hand drawing, and bookkeeping.

In the workshops the following trades are learned: Boys—forging, metal turning, fitting, tool making, manufacture of instruments of precision, ornamental locksmithing, modelling, carpentry and joinery, wood turning; girls—embroidering for dresses or furniture, dressmaking, millinery, making underclothes and other articles of linen, industrial drawing.

Generally speaking, such schools are of the same grade as the advanced primary schools. The pupils are from 12 to 13 years of age upon entering, and must have already finished the course in some elementary primary school.

The admirable and practical system, understood to be the creation of M. Alfred Deutsch, adopted in two of the girls' schools, can be readily understood from the following illustration: A young girl, selected from a section of eight or ten, was shown a fashion plate of costumes and told to sketch one on a blackboard from memory, at the same time adapting it to a very stout girl who was chosen as the person for whom the costume was to be made. This she did, referring only twice to the fashion plate for an instant. Then the measure was taken, and the cutting and basting done by the rest of the section. In twenty minutes time a costume was completed, which was an exact reproduction of *that sketched* upon the blackboard.

Municipal trade instruction in Paris is being constantly extended to new industries. There already exist four manual apprenticeship schools for boys: Diderot School for work in metal and wood; School of Industrial Physics and Chemistry; Trade School for Furniture Making; Trade School for the Book Industries. Two more schools, the Crozatier School for Bronze Industries and the School for the Building Trade, will soon be opened.

For female education six industrial and housekeeping schools exist where girls can learn a trade. Two other schools of the same nature will soon be opened.

The studies and apprenticeship training are gratuitous. The pupils who follow the complete course (three or four years) receive a certificate of apprenticeship. The pupils standing best receive prizes of from 50 to 300 francs ($9.65 to $57.90).

DIDEROT SCHOOL FOR APPRENTICES, PARIS.

The Diderot School was opened in January 1873 as a municipal institution. The aim of the school is to form workmen who are intelligent and proficient in all the details of their trade.

Workmen are instructed in the following occupations, comprising metal and wood work: Forging, metal turning, fitting, locksmithing, machines of precision, patternmaking, carpentry, and wood turning.

The duration of an apprenticeship is three years. During the first year pupils pass successively the workshops for wood and those for iron, with a view of finding out their special aptitude. During the last two years they remain in the trade which they have chosen with the consent of their parents and according to the vacancies that exist. Following is the programme of studies:

MANUAL WORK.

First year.—Pupils pass successively through all the different workshops for wood and iron.

FORGE WORK.

Second year.—Preliminary exercises, tools, welding.
Third year.—Forging parts of machines.

METAL TURNING.

Second year.—Making tools, fittings, turning simple pieces, drilling, and boring.
Third year.—Adjusting joints and sockets, screw cutting, screw cutting by hand.

SMALL MECHANICS.

Second year.—Tools. Fitting and turning small pieces.
Third year.—Small machines, models for demonstration.

ARTISTIC LOCKSMITHING.

Second year.—Tools, keys, locks, architectural iron work.
Third year.—Joining pieces, ornaments, leaves, artistic iron work.

PRECISION.

Second year.—Preliminary exercises, tools, screw cutting by hand.
Third year.—Physical and telegraphic apparatus.

PATTERNMAKING.

Second year.—Patterns for simple parts of machines.
Third year.—Machine tools, gearing, loam boards for founderies, core boxes.

CARPENTRY.

Second year.—Fitting tools, joining, various frames.
Third year.—Doors, sashes, furniture mountings.

WOOD TURNING.

Second year.—Mounting and fitting tools, handles and simple pieces, screw cutting by hand.
Third year.—Turning patterns for founderies, twisted pieces and mountings.

The class instruction comprises grammar, orthography and composition in the French language, arithmetic, geometry, industrial chemistry, metallurgy, physics, technology, mechanics, history of France, geography, free-hand drawing, drawing from models in clay, iron, and wood, mechanical drawing, and, during the last year, bookkeeping.

The day's work comprises four hours and a half in the workshops for the first two years, six hours and a half for the third; four hours of class instruction for the first two years, three hours for the third.

The school is in session from 7.30 a. m., for pupils of the first and second years, and from 6.45 a. m. for pupils of the third year, until 6 p. m., with an intermission for luncheon.

Instruction is free; the pupils are furnished gratuitously with all the objects necessary for their studies and manual work. None are admitted under 13 or over 16 years of age. Sometimes pupils having a certificate of graduation from elementary primary schools are admitted at the age of 12 years. Candidates are received after having passed an examination at the school consisting of a dictation; a problem of arithmetic, whole numbers; a problem in fractions; a problem on measurements of surfaces or volumes applying the metric system; a free-hand sketch.

The children of persons living outside of Paris, in the suburbs, may be admitted by competitive examination, on condition that the community in which they live agrees to pay 200 francs ($38.60) per year for fees.

The school is under the administration of the school board of the city of Paris. The annual expenses of the school amount to about 160,000 francs ($30,880.)

The whole number of graduates of this school is 880. Out of 756 of these whose occupations are known 660, or 87.3 per cent., are following some technical vocation.

SCHOOL OF INDUSTRIAL PHYSICS AND CHEMISTRY, PARIS.

The School of Industrial Physics and Chemistry was founded in 1882. The object of this school is to give scientific and practical instruction at the same time, and to fit the pupils for actual work, either as engineers or superintendents of shops, in industries where chemical or physical knowledge is required.

The instruction embraces algebra, study of functions, differential cal-

culus, integral calculus, trigonometry, descriptive geometry, pure and applied mechanics, general and applied physics, hydrostatics and heat, electricity and magnetism, optics and acoustics, general chemistry, analytical chemistry, technological chemistry and metallurgy, organic chemistry applied to industry.

The instruction also includes experiments in chemistry, organic and inorganic, general physics and its applications, practical work in chemistry, physics, photography, and drawing.

At the end of the second year the best pupils receive a travelling scholarship in order to visit, during their vacation, the most important industrial centres; they are obliged to make a detailed report of their observations.

During the first eighteen months pupils of the same classes remain together both in the class instruction and in the exercises in the shops; after that time they are divided into two classes, that for physicists with ten and that for chemists with twenty pupils.

The pupils remain at the school from half past 8 a. m. until 6 p. m. A lunch is furnished them and they are not permitted to take their meals outside.

Outside the class hours pupils are constantly occupied in the various laboratories under the direction of professors or assistants. The practical work takes up about one-half the time each day. Three hours per week are devoted to drawing. Once or twice per week three hours are devoted to wood and iron work, glass-blowing, etc., in the workshops. The course of study extends over three years.

The attendance is limited to 30 pupils for each year, making a total maximum of 90 pupils at one time.

The instruction is entirely gratuitous. Pupils may receive a compensation of 50 francs ($9.65) per month during the three years.

Pupils are admitted by competitive examination, the best 30 being chosen each year. The examination comprises a composition in French, arithmetic, algebra, plane geometry and geometry of space, physics and chemistry, including problems; also oral examination in mathematics, physics, and chemistry. Candidates must be of French nationality, between the ages of 15 and 19 years, and their parents must be citizens of Paris or of the same department outside of Paris. In the latter case the community in which they live must reimburse the city of Paris 200 francs ($38.60) for the three years studies, and the pupils are not eligible to the monthly compensations.

This institution is under the administration of the school board of the city of Paris.

MANUAL APPRENTICESHIP SCHOOL FOR THE BOOK PUBLISHING INDUSTRY, PARIS.

The manual apprenticeship school for the book publishing industry was founded in 1889 by the city of Paris.

The "object *of this school is to* produce," for the book publishing indus-

try, "skilful and intelligent workers capable of maintaining the tra tions of taste and superiority of French industry."

The trades taught are bookbinding, stereotyping, lithographing, (graving, and photography. The course of instruction lasts four yea and embraces, besides practical instruction in the shops of the scho the following subjects: French language, history, geography, arithm tic, algebra, geometry, history of art, drawing, calligraphy, and mo elling. The instruction in these subjects is most thorough, and is f from being of an elementary character. The table following showst character and amount of the instruction, both theoretical and technic

COURSE OF STUDY IN THE MANUAL APPRENTICESHIP SCHOOL FOR THE BO PUBLISHING INDUSTRY, PARIS.

Subject.	Hours per week.		
	First year.		Second y
Theoretical instruction (8 a. m. to 12 m.).	*Hrs.*	*Min.*	*Hrs.*
Anatomy, artistic			
Chemistry (laboratory work)	1	25	1
Composition, artistic			
Descriptive and perspective	1	00	1
Drawing	2	50	2
Drawing, linear	1	25	1
Geography and history	1	25	1
Grammar	1	00	1
Grammar, typographic		55	1
Gymnastics		55	1
History of art	1	25	1
History of book publishing	1	00	1
Manual training			1
Mathematics	2	00	1
Mechanics	1	25	1
Modelling	2	50	2
Natural history	1	00	
Physics	1	00	
Writing	1	25	1
Recreation	1	00	
Total	24	00	24
Technical instruction (1 to 6 p. m.).			
Autograph and script lithographing	*a* 4	50	
Bookbinding	*b* 2	25	
Composition	*b* 4	50	
Electrotype impressions	*b* 2	25	
Engraving, copper	*a* 4	50	
Engraving in relief	*a* 4	50	
Engraving on stone	*a* 4	50	
Engraving, wood	*a* 4	50	
Gilt edge work	*b* 2	25	
Impression, copper	*a* 4	50	
Impression, lithographic	*a* 4	50	
Iron work	*b* 4	50	
Justification and type founding	*b* 4	50	
Leather gilding	*b* 2	25	
Lithographing	*a* 4	50	
Photo-engraving and phototyping	*b* 2	25	
Photography	*b* 2	25	
Preparing and ruling paper	*b* 2	25	
Script engraving on copper	*a* 4	50	
Stereotype impressions	*b* 2	25	
Wood work	*b* 4	50	
Recreation	1	00	
Total	30	00	*c* 30
Total (theoretical and technical)	54	00	54

a For seven weeks only.
b Every other week.
c Pupils of the second year and later, who are assigned to their trades, work the entire time, f to 6 p. m., in their respective shops. From 3.20 to 3.30 they have a recess.

This school was established in 1889; two years after it had 300 students.

The school is free to the sons of residents of Paris who are of French nationality. The sons of French parents residing outside of Paris are admitted upon payment of 200 francs ($38.60) each year of the course. Two meals per day (breakfast and luncheon) are given to the pupils.

Candidates for admission are subjected to a competitive examination on the following subjects: Copy from dictation, two problems in arithmetic to test the applicant's knowledge of simple and compound numbers, fractions and decimals and the metric system, and drawing an ornamental figure from an object in relief. The candidates must be 12 years of age and not over 16, and must be provided with certificates of birth, vaccination, and primary education.

The school is maintained by the city of Paris, and is under the administration of the Paris school board. A committee of supervision, consisting of 9 members of the municipal council, 2 specialists, 2 members of the school board and one literary man, have immediate control of the school.

MANUAL APPRENTICESHIP SCHOOL OF FURNITURE MAKING, PARIS.

The Manual Apprenticeship School of Furniture Making, called *École Boulle*, was founded as a municipal institution in 1886. Its object is to form workmen for all branches of furniture manufacture, such as wood carvers, modellers, cabinetmakers, joiners, and upholsterers.

The manual work comprises cabinetmaking, upholstering, wood carving, chair making, and turning in wood, iron, etc. The first year pupils work in all the shops, in order to get a general idea of the different trades relating to furniture making and to find out for which trade they are best adapted. The remaining three years are passed in the same shops, each pupil continuing at his trade.

The theoretical instruction comprises industrial drawing, model and object drawing, modelling, history of art, technology, geometry, arithmetic, French language, history, and geography.

The school is in session from 8 a. m. until 6 p. m. The mornings are reserved exclusively for class instruction, drawing, and modelling; the afternoons from 1.30 to 6 p. m. are employed as follows:

During the first year, exclusively at shopwork; during the second and third years, two and one-half hours at drawing and modelling, and two hours in the special workshops; during the fourth year, in the workshops and in visiting museums and industrial establishments.

The number of pupils admitted each year is 60, making a total attendance of about 240. These pupils are divided into the following groups after the first year: 12 cabinetmakers, 12 upholsterers, 12 wood carvers, 12 chair makers, 12 turners (wood, iron, etc.).

Up to the summer of 1891 only one class of 35 pupils had graduated, 25 out of the 60 having left during the four years.

Pupils must be from 13 to 16 years of age when they enter, and must be provided with a certificate of primary education. Pupils of 12 years are sometimes admitted if provided with such certificates. They are admitted by competitive examination on the following subjects: French composition—attention being given to the style, orthography, and penmanship, and object drawing—an ornamental design from an object in relief. Certificates of birth, vaccination, and good constitution are also required. The same residential qualifications are required as in the two preceding cases.

The school is maintained by the city of Paris, and is under the administration of the Paris school board. The annual expenses of the school amount to about 160,000 francs ($30,880).

INDUSTRIAL AND HOUSEKEEPING SCHOOLS FOR GIRLS, PARIS.

There are six of these industrial schools maintained by the city of Paris. Four of them were founded recently by the city. The other two had been private institutions, but became city property, one in 1884, the other in 1886.

The object of these schools is to teach young women certain trades which pertain to their sex, and at the same time to instruct them in the duties of housewives.

The programmes and distribution of classes are, in general, the same in all the schools, so that the information for one will nearly apply to all.

The course of instruction is divided into two divisions—the general course, in which all must take part regardless of their trades, and the special courses comprising the following trades: Plain sewing and finishing, linen needlework, washing and ironing, embroidery—white and colored, artificial flowers and millinery, corset making, underwear making, fashionable dressmaking.

The general course comprises: Primary instruction (advanced); elements of bookkeeping; linear drawing; cutting and finishing; gymnastics; one foreign language (English); domestic economy and practical instruction in kitchen and housework.

Pupils must remain at the school from 8.30 a. m. until 5.30 p. m. They are not permitted to leave for the noonday meal, but a luncheon prepared by themselves is furnished free of charge. Following is the distribution of classes:

COURSE OF STUDY IN THE INDUSTRIAL AND HOUSEKEEPING SCHOOLS FOR GIRLS, PARIS.

Subject.	Hours per week.		
	First year.	Second year.	Third year.
Arithmetic	2	1	1
Bookkeeping	*a*1	1	1
Chron. gen		1	
Composition	2	2	3
Cutting		1	1
Dictation exercises		1	
Diction	1	1	
Drawing	2		
English	1	2	2
French	2	1	3
Geography	2	2	2
Geometry			1
Geometry and physics		1	
Gymnastics	1	1	
History	2	2	2
Literature			1
Problems		1	
Science	1	1	1
Singing	2		
Kitchen and housework, marketing, washing and ironing	(*b*)	(*b*)	(*b*)
Trade instruction:			
Sewing; embroidery; millinery and artificial flowers; painting; industrial drawing or commercial bookkeeping	21½	21½	21½
Cutting	4½		
Drawing		4½	4½
Total	44	44½	43½

a Every other week.
b Eight pupils detailed in turn to serve one week.

The total number of pupils in five of the schools was 1,896 in 1891.

Pupils visit the schools not only to learn certain trades, but many attend simply to make themselves more useful at home. Upon leaving the school those desiring to take positions have, as a rule, very little difficulty in finding them.

The schools are free to daughters of residents of Paris of French nationality. Daughters of French parents living in the suburbs may be admitted by paying 200 francs ($38.60) per annum. Pupils are admitted from the age of 12 to 15 years, upon presenting their certificates of primary education. Pupils must furnish their certificates of birth and of vaccination. The materials and the luncheon are provided gratis.

The schools are maintained by the city of Paris, and are under the administration of the school board.

MUNICIPAL SCHOOL FOR THE APPRENTICESHIP OF BOYS, HAVRE.

This school was founded by the city of Havre in 1868. Its object is to form proficient workmen in the following trades: Locksmithing, fitting, forging, metal turning, coppersmithing, moulding and foundery work, carpentry, cabinetmaking, wood turning, wood carving, and patternmaking.

The apprenticeship is for three years. Pupils, upon entering the school, are at once placed in their respective shops according to their own choice. If found unfit for the trade chosen they may be transferred to another shop.

In each of the professions the pupils begin with a careful study of the names, uses, and manner of handling the various tools pertaining to the occupation. The work consists of a systematic development of the practical knowledge and skill of the pupil, by placing before him such pieces as will gradually give him experience in all the principal phases of the work of his profession. This includes both practice pieces according to a fixed programme and useful finished articles. The locksmiths and fitters take turns at the forge three months every year. The fitters take turns at the steam engines two by two. In the shop-work the pupils are separated into groups of six each, and the work performed remains always in the same group.

The instruction in drawing is considered very important and comprises geometrical drawing, projections, linear drawing, and industrial drawing, the latter varying with the trade of the pupil.

Following are the branches taught and the number of hours per week devoted to each:

COURSE OF STUDY IN THE MUNICIPAL SCHOOL FOR THE APPRENTICESHIP OF BOYS, HAVRE.

Subject.	Hours per week.		
	First year.	Second year.	Third year.
French language	2	2	2
History	1	1	1
Geography	1	1	1
Science	1	1	1
Mechanics	.....	1	1
Geometry	2	2	1
Algebra	1	1	1
Arithmetic	2	2	2
Drawing, geometrical and industrial	6	5	6
Drawing, linear and ornamental	1	1	2
Gymnastics	½	½	½
Singing	½	½	½
Shop work	28	28	31
Total	46	46	50

The following table shows the attendance during the year 1890–'91:

ATTENDANCE AT THE MUNICIPAL SCHOOL FOR THE APPRENTICESHIP OF BOYS, HAVRE.

Pupils—	First year.	Second year.	Third year.	Total.
Admitted October 1890	141	67	51	259
Left school during the year 1890–'91	52	19	4	75
In attendance at the end of the year	89	48	47	184

At the end of the previous year the attendance was 170 pupils.

The following are the occupations of pupils who finished their course of study in 1891: Fitters, 16; metal turners, 3; locksmiths, 5; carpenters, 13; blacksmiths, 2; coppersmiths, 2; machine mounters, 6; total, 47.

Of 131 graduates who have formed an alumni association, only 3 are not engaged in some purely technical calling. Further statistics are unfortunately not available for this, one of the best institutions of the kind in France.

Instruction is entirely gratuitous. Considerable of the work done at the school is such as is ordered by customers, or is sold in other ways. The income derived from this source is distributed, as prizes, among the pupils of the third year. These prizes generally vary from 100 to 300 francs ($19.30 to $57.90). Pupils with good records are presented with their tools upon leaving the school at the end of their apprenticeship.

Candidates for admission must be from 12 to 15 years of age. They are admitted by competitive examination, and must present certificates of education and of good conduct. Pupils are on trial about two months before they are definitely placed in their respective shops.

This school is maintained by the city of Havre. Small subsidies are received from the ministry of commerce and industry, and from the department. The budget for 1892 was as follows:

Salaries of director and class instructors	$2,489.70
Salaries of subdirector and technical instructors	4,911.85
Fuel, for machinery, heating, etc	772.00
Lighting, for shops, school rooms, etc	289.50
Tools and furniture	772.00
School supplies of various kinds	368.80
Total	9,543.85
Materials bought with state subsidies	386.00
Materials bought with department subsidies	38.60
Prizes to pupils and materials bought with the money obtained from sale of products of the school	1,930.00

This school is under the same direction as the other municipal schools. Conformably to the national law of December 11, 1880, a special committee of patronage and surveillance is appointed for the school.

MANUAL APPRENTICESHIP SCHOOL FOR BOYS, SAINT-ETIENNE.

This school was founded by the city of Saint-Etienne in 1882. Its object is to prepare for the industries of the vicinity workmen who are well instructed and who are capable of advancing to the positions of foremen and superintendents.

There are eight trades taught, viz., fitting, gunsmithing, forging, moulding, carpentry and patternmaking, weaving, dyeing, modelling and sculpture.

The instruction is theoretical and practical, and covers a period of four years. During the first year the pupils pass through the different workshops in order to get a general idea of manual work. After the first year of trial they are assigned to work at their trades according to their tastes and fitness.

The fitters pass some time at the forge in order to learn how to forge their tools. At the beginning of the third year they are subdivided—those who wish to become fitters and others who seek to fit themselves for gunsmiths.

The patternmakers pass some time in the shops for moulding and

casting in order to understand the uses that are made of the patterns. All the work is executed from sketches or plans made by the pupils themselves.

Pupils of the section for weaving study the composition of textures, prepare the looms, execute work on the different kinds of looms, learn to read and prepare cards, perfect the work, and analyze samples. They also study the development and construction of machinery used in weaving. The work done in all the shops is practical, such as an apprentice in an establishment would perform, only that it is done more systematically.

Particular attention is given to drawing. The first year pupils do only free-hand drawing from copy and geometrical solids. At the beginning of the second year the drawing is special for each section or group.

The manual work occupies three hours per day the second year, four hours the third year; and five hours the fourth year. During the last six months it continues seven hours in order to accustom the pupils to the hard work required in an establishment.

The theoretical instruction is identical to all pupils of the same division. It is intended to give a good general education so as to develop their intellectual faculties. The subjects taught and the number of hours per week devoted to each are as follows:

COURSE OF STUDY IN THE MANUAL APPRENTICESHIP SCHOOL FOR BOYS, SAINT-ETIENNE.

Subject.	Hours per week.			
	First year.	Second year.	Third year.	Fourth year.
French language (orthography, grammar, reading, recitation, style).	4	3	2	.....
Instruction, moral and civil, political economy and legislation.	1	1	1	
Bookkeeping	.....	.....	1	.....
History and geography	2	2	1	.....
Mathematics (arithmetic, algebra, geometry, descriptive geometry).	5	5	4	
Mechanics and technology	.....	.....	2	
Physical and natural sciences	2	3	1	.....
Drawing	4	6	6	
Penmanship	1	1	.....	.....
Total	19	21	18	

The attendance is, on an average, about 300 pupils. About 250 have graduated since the foundation of the school.

The pupils upon leaving the school usually find employment in the arms manufactories, either as mechanics, turners, or draughtsmen; in other iron and steel works; in weaving establishments as office employés for technical work, such as examiners, finishers, overseers, etc.; in dyeing establishments; and in carpenter shops. The time during which the school has been in operation is too short to have produced many higher officials, and most of the early graduates are now doing military duty.

About 35 per cent. of the students remain to graduate; 55 per cent. stay 3 years. Experience has shown that almost every one in these classes enters some technical vocation.

Instruction is gratuitous. Candidates must be at least 13 years of age, and must present a certificate of primary education or pass an examination.

This school is under the administration of the city government, in the same manner as the other public schools.

Many other excellent manual apprenticeship schools exist in France. In general characteristics they do not differ materially from those whose organization has been outlined in the preceding pages.

It is always a question of interest to know what becomes of students who have followed courses in this kind of an institution. The following statements give, partially at least, the desired information for several other schools from which statistics were available.

MANUAL APPRENTICESHIP SCHOOL FOR BOYS, REIMS.

This school was founded in 1875 conjointly by the city and the Industrial Society of Reims. The first of the following tables gives the occupations of graduates of the school, and indicates the number, without showing the occupations, of those leaving the school without graduating. The second table gives the occupations of those who did not remain to graduate.

OCCUPATIONS OF EX-STUDENTS OF THE MANUAL APPRENTICESHIP SCHOOL, REIMS.

Occupation.	1877	1878	1879	1880	1881	1882	1883	1884	1885	1886	1887	1888	1889	1890	1891	Total.
Army	....	1	....	5	1	....	....	....	2	....	3	4	1	2	2	21
Draughtsmen	....	....	1	4	2	2	3	3	2	5	....	2	3	4	....	31
Employés, banks, wine trade, and wholesale commerce.	....	5	....	4	2	3	....	2	3	2	6	7	6	8	6	54
Employés. non-technical, miscellaneous.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	1
Employés, postal, telegraph, and other government service.	....	1	....	....	....	....	....	....	....	1	1	....	....	....	....	3
Employés, railway service	....	....	....	1	1	....	1	2	....	2	1	2	1	....	....	11
Employés, retail trade	....	....	2	2	1	2	3	2	2	....	1	1	2	4	1	23
Employés, technical, boiler and machine shops, chemical works, etc.	....	5	8	6	7	8	4	2	4	5	2	1	5	4	5	66
Employés, technical, building, locksmithing, etc.	....	....	....	....	2	1	....	4	2	2	4	....	2	4	....	21
Employés, technical, woollen industry.	....	6	3	2	7	4	1	10	4	5	2	9	0	6	9	77
Farmers	....	....	....	....	1	....	....	....	....	....	....	1	....	....	....	2
Road and bridge construction	....	2	5	....	....	2	1	2	1	....	....	....	....	....	1	14
Students, agricultural schools	....	....	....	....	....	1	1	....	....	....	1	....	1	....	....	4
Students, colleges and collegiate institutes.	....	....	1	....	....	2	....	1	4	....	....	....	1	....	1	10
Students, institutes of technology.	....	....	....	....	2	1	1	4	4	9	2	6	11	7	5	52
Students, normal schools	....	....	....	....	....	....	2	6	3	3	3	1	....	1	....	19
Students, schools for naval engineers.	....	....	....	....	....	....	....	....	2	....	1	....	4	2	2	11
Students, other schools	....	....	....	....	....	....	....	....	....	....	....	....	2	6	4	12
Unknown	....	2	1	2	1	....	....	1	1	....	....	2	....	3	6	19
Left school without graduating.	18	59	37	44	39	27	60	54	65	59	56	82	72	86	61	819
Total	18	81	58	70	66	53	77	93	99	93	83	118	120	137	104	1,270

OCCUPATIONS OF EX-STUDENTS (LEAVING SCHOOL WITHOUT GRADUAT
THE MANUAL APPRENTICESHIP SCHOOL, REIMS.

Occupation.	1877	1878	1879	1880	1881	1882	1883	1884	1885	1886	1887	1888	1889	1890	18
Army	....	3	2	3	1	1	....	3	1	4	1	....	2	1	1
Draughtsmen	....	1	....	2	....	....	1	....	5	2	1	3	....	1	2
Employés, banks, wine trade, and wholesale commerce.	....	1	1	4	....	1	3	9	2	3	3	4	4	10	1
Employés, non-technical, miscellaneous.	....	....	....	....	....	1	2	....	....	1	3	2	4	5	3
Employés, postal, telegraph, and other government service.	....	....	....	1	....	....	....	....	....	1	....	1	....	....	1
Employés, railway service	....	1	....	....	....	1	1	2	....	....	....	....	1	....	....
Employés, retail trade	....	2	2	3	5	2	2	1	3	6	6	3	9	13	8
Employés, technical, boiler and machine shops, chemical works, etc.	....	1	....	3	....	1	2	3	2	2	1	3	6	5	1
Employés, technical, building, locksmithing, etc.	3	4	3	6	5	6	8	6	11	11	16	12	14	25	13
Employés, technical, woollen industry.	....	....	....	2	....	....	1	....	1	....	1	2	4	2	1
Farmers	....	....	....	2	....	....	1	1	....	3	1	2	....	....	5
Road and bridge construction	....	2	1	....	....	....	1	....	....	....	....	....	....	....	....
Students, agricultural schools	....	....	....	....	....	....	....	....	....	....	....	....	....	1	2
Students, colleges and collegiate institutes.	....	1	1	1	1	....	1	....	1	1	....	3	1	4	....
Students, institutes of technology.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Students, normal schools	....	....	....	1	....	....	....	....	....	....	....	....	1	....	1
Students, school for naval engineers.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Students, other schools	....	....	....	1	....	2	1	....	1	....	1	2	2	2	1
Unknown	15	43	27	15	27	12	36	29	38	25	22	45	24	17	21
Total	18	59	37	44	39	27	60	54	65	59	56	82	72	[illegible]	61

A very large proportion of students, nearly two-thirds, leave without completing the course of study. The percentage is not abnormal nor appreciably higher than for other similar schools in different parts of France. There are several causes for this state of affairs. Students are in many cases compelled to withdraw by their parents removing from the neighborhood of the school. This accounts for the large number of those whose occupations are unknown in the table for students leaving without graduating.

Parents of students attending manual apprenticeship schools of this sort belong usually to the working or lower middle classes. Needing all the income possible, they are apt to take away their children as soon as they can find for them a remunerative occupation. Such lack of consideration works a grave injustice alike to scholar and school and is the greatest obstacle manual apprenticeship institutions have to contend with. A great many parents send their children for a year, or a year and a half at most, for the sake of the name of having them educated in a manual apprenticeship school, a fact which enables a boy to more easily find employment.

There has been with the growth of time, however, a marked improvement in the sentiment of the working classes, particularly, in this regard. Experience has taught them that a year or two of sacrifice at this age of a boy's life is better for all parties.

All tuition charges were abolished in 1882–'83. This fact accounts for the large augmentation of scholars leaving without graduating, which

an in that year. A greater percentage of children of the poorer sses came in, and consequently the proportion of those who from one use or another were unable to finish their course of study increased. The occupations enumerated in the foregoing tables (students of ourse excepted) are those which were finally chosen, not those into hich students entered the first thing upon leaving, which might well be in many instances mere makeshifts.

The tables disclose the fact that among graduates whose occupations are known some 65 per cent. are pursuing technical vocations for their life's work. Amongst those who left before graduation 53 per cent. of those about whom the essential facts are known are technically employed.

MANUAL APPRENTICESHIP SCHOOL, NANTES.

This institution was founded in 1838 and has graduated in all nearly 4,000 pupils. Only in recent years has an alumni society been formed. The statistics of occupations, followed by members of this organization, give the following results:

OCCUPATIONS OF EX-STUDENTS OF THE MANUAL APPRENTICESHIP SCHOOL, NANTES.

Occupation.	Number.	Per cent.
Technical employés, industrial establishments	184	30.8
Technical employés, government service	81	13.5
Technical employés, railways	15	2.5
Students, technical schools	28	4.7
Total	308	51.5
Employés, commercial pursuits	159	26.6
Non-technical employés, government service	84	14.0
Miscellaneous	47	7.9
Total	598	100.0

MANUAL APPRENTICESHIP SCHOOL, SAINT-CHAMOND.

This school was founded in 1879. In January 1892 the attendance was 90. The table below gives a list of the occupations chosen by the 409 pupils who have left the school since the beginning:

Occupation.	Number.
Blacksmiths	
Boiler makers	
Carpenters	
Chemists	
Clerks, etc	
Draughtsmen	
Dyers	
Fitters	
Locksmiths	
Machinists	
Moulders	
Patternmakers	
Turners, metal	
Watchmakers	
Various manufacturing industries	
Students, higher schools	
At home	
Total	

MANUAL APPRENTICESHIP SCHOOL, ROUEN.

Since the foundation of the school in 1878 about 200 pupils have graduated. They are mostly occupied in industrial establishments in the city and vicinity and in the railway car shops. All work at the trades they learned in school.

MANUAL APPRENTICESHIP SCHOOL, BOULOGNE-SUR-MER.

In 1891 the attendance was 46 in the first year class, 15 in the second, and 7 in the third. The relative diminution is caused by parents putting their children to work before they have finished their studies. Pupils leaving school generally adopt some trade. Some of them enter the navy as engineer apprentices.

BOOK WORK IN RELATION TO MANUAL TRAINING.

This question is difficult to answer directly. It will be remembered that the advanced primary and manual apprenticeship schools are considered to be of the same grade. In the first instance the law prescribes eighteen hours as the minimum of intellectual instruction per week. In the second the maximum is set down as ten. As a matter of practice the minimum in the former case far exceeds the number named. But this is after all merely a comparison of a high school where manual training may or may not exist, according to the circumstances, with an elementary trade school.

Though statistics are not available in support of the assertion, careful observation and inquiry lead to the belief that the amount of book work accomplished by students in manual training schools is practically the same as that done by students in schools of the same grade where manual training is not a factor. Furthermore, it is generally the case that students who do well at manual training are also apt in intellectual exercises, while the converse does not nearly so often hold good.

Too often in advanced primary schools the only time available for manual training is two hours after the intellectual exercises of the day have been completed, and when under ordinary circumstances the school would have adjourned. In such cases, therefore, the intellectual work of both classes of students must of necessity cover the same ground.

EDUCATION OF A PURELY INDUSTRIAL CHARACTER.

In the schools which we have thus far considered we have been dealing with the four classes of schools in the general system of public primary education, viz., the infant schools, the elementary primary schools, the advanced primary schools, and the manual apprenticeship schools. In the first three classes the manual work is educative pure

and simple, and any industrial value which it may have is general and remote rather than special and immediate. In the last class—manual apprenticeship schools—the training begins to assume a purely industrial character. It is designedly elementary trade training. Schools of this class, as has been indicated, are founded by departments and municipalities, and their operation is determined by the law of December 11, 1880.

With the exception of the class of schools last mentioned education of a purely industrial character does not possess in France any general organization, nor are the institutions in which it is given subject to any special obligation. These institutions may be divided into three grades—primary, secondary, and superior.

Primary education of an industrial character is given in three different classes of schools—the national manual apprenticeship schools at Armentières, Vierzon, and Voiron, and the national school for watchmaking at Cluses; the manual apprenticeship schools just referred to as a part of the general public school system and fully described in an earlier part of this chapter; and institutions or annexed courses founded by industrial societies, chambers of commerce, or private associations.

The national schools are maintained by funds annually voted by the chambers and appropriated in the budgets of the ministers of public instruction and of commerce and industry.

Manual apprenticeship schools are supported in the same way.

The third category—*i. e.*, institutions founded by industrial societies, chambers of commerce, or private associations—are maintained at the expense of their founders. They may draw, however, a special subsidy from the minister of commerce and industry. During 1890, 87 institutions and annexed courses of this character received from this source subsidies amounting to $49,624.49.

Secondary education of an industrial character is given in the three national schools of arts and trades at Aix, Angers, and Châlons, in the central school of Lyons, and in the Industrial Institute of the North at Lille. The first three schools are supported by appropriations from the ministry of commerce and industry, the fourth mainly from a private endowment, and the last principally by the department municipality.

Besides the schools for telegraphy, mines, and road and bridge construction, which are attached to the appropriate ministries, superior technical instruction is given in the National Conservatory of Arts and Trades, and the Central School of Arts and Manufactures.

The National Conservatory of Arts and Trades was founded in 1794. The aim of its founders was to promote the industrial transformation of the country and to disseminate a knowledge of mechanical inventions. At the outset indeed special agents were charged to demonstrate

to visitors the operations of new machines and to report to the government all inventions and mechanical improvements.

Later, in addition to the museum, courses of applied science were organized. These courses are public, and are held in the evening from November to April. They are open to the public without any formalities whatever.

More detailed information in relation to representative institutions of the various grades mentioned will be found in another part of this report.

PRIMARY INDUSTRIAL SCHOOLS.

NATIONAL SCHOOL OF MANUAL APPRENTICESHIP, ARMENTIÈRES.

This school was founded in accordance with a decree of the national government passed March 10, 1882. It was opened in 1887. Like those at Vierzon and Voiron, it is intended to serve as a type for the other institutions for manual apprenticeship that may be organized by the departments, communes, or private associations.

The school comprises three divisions: The kindergarten, the elementary primary school, and the advanced primary school.

The object of the kindergarten division of this school is to teach the children to read, write, talk, reflect, and do a little work with paper and linen. They begin with paper flowers, then make objects in cardboard after pictures and explanations by the teachers, or sometimes after drawings on the blackboard. They also do needlework after patterns, make paper lamp shades, etc. The teachers relate to them events of history and give them ideas of geography, illustrating by means of pictures on cardboard. The school is in session from 8 to 11 a. m. and from 1.30 to 4.30 p. m. Four hours a day are devoted to intellectual training, one hour to manual work, and one hour to recreation. This school differs from those generally known as *écoles maternelles publiques* in that its aim is not so much to render service to laborers by taking care of their children, as it is to prepare the way for further instruction. For this reason the hours of session are much shorter. The children are mostly those of the better class of working people. One hundred and ten pupils attend this school, ranging in age from 3 to 7 years. They are instructed by a directress and an assistant.

The elementary primary division follows the programme, decreed by the minister of public instruction, for the elementary primary schools of France. Each pupil has two hours per week of manual training. They begin with making patterns of woven goods, simple squares, etc., on paper. In the second year they have albums in which they paste different colored papers, making first simple weaving patterns, then geometrical figures. All this work, even the cutting of the paper, is

done by the child. At the end of the second year the pupils begin to draw geometrical figures in pencil. Later on they do pasteboard and wire work, and finally, during the last year, they enter the workshops for wood and iron work.

The course of study is for five years. The pupils are divided into four classes—two primary and two advanced classes. The school is in session from 8 to 11 a. m., and from 1.30 to 4.30 p. m. Pupils of the two advanced classes remain from 5 to 6 p. m. for study.

The pupils are from 7 to 12 years of age; 150 attend this school; 125 have graduated. Of these 80 entered the advanced primary school.

The instruction is given by a director and three assistants.

The manual work of the highest class (which goes to the workshops) is done one day in the forenoon and the next day in the afternoon. For the other classes the manual training is always gone through in the afternoon from 3.30 to 4.30, the last school hour.

The object of the advanced primary division of this school is to educate the pupils so that they may become foremen and superintendents of workshops.

The course of instruction covers from three to six years, according to the efficiency of the pupils. The programme of studies is general, like that prescribed for advanced primary schools, except that special attention is given to practical branches which are not covered by the general programme.

During the first year pupils go five months to the workshops for carpentry and five months to those for iron work. At the beginning of the second year pupils specialize, after which they remain either at wood or iron work. Those who take the course in weaving begin at that work immediately upon entering the school. There are three workshops for carpentry, and eight for iron work (fitting and forging) and weaving.

During the first year three hours per day are devoted to manual training, and during the second and third years four hours daily. The period is from 1.30 to 4.30 p. m. for the first year, and 8 to 12 a. m. for the other years. The school is in session from 8 a. m. to 12 m. and from 1.30 to 6 p. m.

The attendance is 155 pupils, 105 of which board at the school. Sixty-seven pupils have completely finished their studies. Of these 1 has gone to a national school of arts and trades, 10 into the marine service as engineers, 34 in various industries, 10 in commerce, 3 in the railway shops as fitters and machinists, 6 in other institutions of instruction, 2 in the government service (roads and bridges, etc.), and 1 is a teacher.

The instruction is gratuitous. No charges are made for books or materials. Boarders pay 500 francs ($96.50) per year, and day boarders (*demi-pensionaires*) are charged 200 francs ($38.60) annually. There are a number of free scholarships provided by the state, which are obtained by competition.

Pupils are admitted by competitive examination from among those who have finished their elementary primary education. They are generally from 13 to 15 years of age when they enter, and about 18 years of age when they finish their studies.

The school is supported by, and is under the administration of the ministry of public instruction. The faculty consists of 1 director, 1 accountant (*comptable*), 1 general overseer (who occupies himself with the discipline), 5 overseers, 6 professors, 1 superintendent of shops (graduate of a national school of arts and trades), and 7 foremen (chosen from among the master workmen).

Following is the annual budget of this institution:

EXPENSES.

Salaries of director, professors, etc	$12,738.	00
Expenses of maintenance	9,650.	00
Materials, tools, etc	4,632.	00
Total	27,020.	00

RECEIPTS.

Board of pupils	8,202.	50
Subsidy of state for free scholarships	2,991.	50
State subsidy	15,826.	00
Total	27,020.	00

COURSE OF STUDY OF THE NATIONAL SCHOOL OF MANUAL APPRENTICESHIP, ARMENTIÈRES.

Subject.	Hours per week.					
	First year.		Second year.		Third year.	
	Section A.	Section B.	Section A.	Section B.	Section A.	Section B.
Algebra				1		
Arithmetic	2	2	2	2		
Chemistry	1½	1½	1½	1½	1½	
Descriptive: sketching, study, interrogation.					3	3
Designing (imitation) and modelling.	1½	1½	1½	1½		
Drawing (copy)	1½	1½				
Drawing, industrial					4½	4½
Drawing, linear	2	3	3	3		
English	3	1	2	2	2	
French	4	4	3	3	2	2
French composition	2					
Geography		2	1	1		1
Geometry	2	2	2	2	2	
Gymnastics	1	1	1	1	1	1
History	1	1	1	1		1
Mathematics					2	8
Mechanics and study					1½	1½
Music	1½	1½				1
Music, instrumental, and study.	1	1	1	1	1	
Natural history	1	1	1	1	1	
Penmanship	1	1				
Physics	1	1	1	1	1	1
Physics and study					1	16
Shop work	12	12	16	16	16	4
Shop work, sculpture for carpenters.			4	4	4	1
Study	3½	4½	3½	2½	1½	3
Recreation	5½	5½	3½	3½	3	
Total	48	48	48	48	48	48

The table which is given below shows the occupations followed by the graduates of the three national schools of manual apprenticeship at Armentières, Vierzon, and Voiron. The small number of graduates from these institutions is accounted for by the recent date of their creation, the school at Voiron being established in 1886 and those at Armentières and Vierzon in 1887. The whole number of pupils in attendance at the three schools in May 1889 was 1,418.

OCCUPATIONS OF GRADUATES OF THE NATIONAL SCHOOLS OF MANUAL APPRENTICESHIP, ARMENTIÈRES, VIERZON, AND VOIRON.

Occupation.	Number.	Per cent.
Army and navy	5	3.3
Employés, agricultural pursuits	4	2.6
Employés, banks, financial institutions, commercial marine, etc	6	3.9
Employés, commercial pursuits	14	9.2
Employés, government service	5	3.3
Employés, railway companies	7	4.6
Employés, technical, industrial establishments	55	36.2
Students, higher technical schools	27	17.8
Students, other schools	12	7.9
At home or unknown	16	10.5
Deceased	1	.7
Total	152	100.0

NATIONAL SCHOOL FOR WATCHMAKING, CLUSES.

This school was founded in 1848 by the government of Savoy, and reorganized by the French government in 1860 and in 1890. The objects of the school are: First, to educate skilful workingmen capable of executing in whole or in part all kinds of instruments for measuring time and such other mechanisms of precision as are used in the sciences and arts; second, to give to young men the instruction necessary for attaining to the positions of manufacturers or superintendents of workshops in this industry.

The course of instruction covers three years. No pupil can attend a fourth year unless on account of sickness or for some other legitimate reason he was obliged to suspend work for more than six weeks.

The practical work comprises:

First year.—(1) Preliminary exercises in filing and chiselling: filing squares, octagons, rules, drill-boxes, screws, and barrel arbors. (2) Tool making: one set of drills with drill-box, one set of screw taps with wrench, one set of polished beams, one screw ferrule, one set of cutting files, one set of lathe tools, exercises in polishing arbor and plate work. (3) Rough work: draughting of plans for, and executing rough work, balances, and cages of various kinds and sizes; different sorts of barrels; rough work for chronometers and auxiliary fusees. First year pupils can not pass into the second year's work until they have passed a satisfactory examination before an examining board.

Second year.—Wheel work, setting, cylinder escapements, etc. The instruction comprises: (1) The mechanisms for winding adopted in the

manufacture. (2) Tools for wheel work. (3) Wheel work: comprising, in succession, cutting and finishing the centre supports and cogs, and work on pinions. The pupils fasten the pinions on the wheels, pivot and set all the movements; set also the minute wheels. Movements as indicated by the board of administration. (4) Tools for cylinder escapements. (5) Cylinder escapements, comprising the cylinder, the balance, etc. (6) Setting the escapements, mounting clocks and watches, and repairing cases.

Third year.—Escapements, finishing, regulating, and accessory work. Instruction comprises: (1) Tools for escapement work, such as for the anchor, the spring, and the duplex, and the necessary ideas of palette escapements. (2) Setting the escapements and finishing. (3) Tools for finishing. (4) Finishing watches: comprising the verification and correction of all the parts, encasing, setting the dial, the hour and minute hands, boring the holes for the caps of the watches, making the different adjustments on stem-winders, and, finally, examining and regulating. (5) The execution of compensated balances and of various kinds of spirals. (6) Other accessory work, such as setting jewels, polishing, and watch repairing.

The theoretical work comprises: French language, arithmetic, elements of algebra, geometry, trigonometry, mechanics, cosmography, physics (especially electricity), and draughting machinery.

The hours of work are arranged as follows:

From October 1 to April 1—8 a. m. to 12 m. and 1.30 to 5 p. m., shop work; 5 to 7 p. m., theoretical instruction. From April 1 to October 1—7 a. m. to 12 m. and 1.30 to 4.30 p. m., shop work; 4.30 to 6.30 p. m., theoretical instruction. The time from noon to 1.30 p. m. is set aside for recreation. In the middle of the morning and of the afternoon 20-minute pauses are introduced. The jurisdiction of the authorities of the school extends beyond the hours of session.

The instruction is conducted by a director, who is also professor of theoretical instruction; an assistant director, who is also secretary of the institution; a chief and a subchief for each of four workshops; two overseers. All these are appointed by the minister of commerce, of industry, and of the colonies.

The present attendance is 130 pupils. More than 1,300 pupils have graduated since the school was founded. With rare exceptions all pupils remain in the profession. Some work in the neighboring countries, but the majority are scattered all over France. Some are exercising the mercantile branches of the industry, some are watch repairers, some are chiefs and overseers of watch factories, and, finally, a certain number are constructors of telegraphic apparatus and scientific instruments.

The instruction is gratuitous. The raw materials and some tools are furnished gratis by the state, while some other tools and the

books are paid for by the pupils. A sum of 25 francs ($4.83) is deposited for each pupil to secure against damage or loss of property through negligence. The minister of commerce, of industry, and of the colonies decides upon the acceptance of pupils. Funds for their partial or entire maintenance are granted from the state treasury to pupils of parents who have established their inability to pay for the same. Classes are formed on November 3 of each year, and candidates must be at least 14 years of age. Every application is made to the prefect of the department in which the parents reside. The educational standards exacted are certificates of primary education, or of knowledge of the elementary branches. On the physical side there is a negative requirement that candidates shall possess no infirmity which might interfere with the exercise of their profession.

The institution is under the jurisdiction of the minister of commerce, of industry, and of the colonies, and under the special supervision of the prefect of the department of Haute-Savoie. It is entirely supported by the French government.

At the end of each scholastic year an examination, covering the subjects taught during the year, takes place before a board consisting of the director, the assistant director, and one chief of a workshop. After this examination all pupils are classified accordingly, account being also taken of their conduct and the work executed by them during the year. Those who have terminated their studies and have passed a satisfactory examination obtain graduating diplomas, conferring the title, graduates of the National School of Watchmaking at Cluses. Pupils who rank first at the end of the third year obtain a gold medal containing the name of the recipient and the inscription *École Nationale d'horlogerie de Cluses—Récompense.* A special diploma is awarded in such cases stating that the pupil obtained the medal. Prizes consisting of tools and scientific works as well as honorable mention are accorded to the best pupils of the first and second years.

This school was founded in 1848 for the purpose of giving a new impetus to the watchmaking industry, which had been losing ground in Savoy. The institution had the following objects: 1st, to introduce into Savoy the perfected methods of work already adopted at Geneva and in the cantons of Vaud and Neuchâtel; and, 2nd, to cause the manufacture of complete watches in Savoy, by teaching the young men all the various branches of the profession.

The result of the school was an immediate revival of the watchmaking industry. When Savoy was annexed to France, in 1860, the school was reorganized and its scope extended. Later on the French government erected the present building, which holds 200 pupils. A decree passed by the French government, in February 1890, effected another reorganization of the school, and on this basis the school is at present conducted.

LA MARTINIÈRE SCHOOL, LYONS.

This school was founded in 1831, with the legacy of Major-General Martin. It comprises two distinct branches, the school for boys and the school for girls.

DIVISION FOR BOYS.

In the division for boys the pupils study the sciences and arts applied to commerce and the industries; the object of the instruction is not to prepare the pupils for any distinct trade, but to render them apt to succeed in any industrial or commercial career by giving them advantages of a practical intelligence, a habit of scientific reasoning, a relatively broad instruction, and above all, by creating an enthusiasm for work.

The course of instruction is for three years. Each year pupils are advanced by competitive examination, and in this way the incompetent are eliminated.

The subjects taught are the following, all of which are obligatory for all pupils in the respective classes:

First year.—Mathematics, drawing, grammar and French composition, physics, chemistry, natural sciences, history and geography, penmanship, manual training, and military exercises.

Second year.—The same subjects with the addition of English and bookkeeping.

Third year.—Completion of the preceding programme, machinery drawing, literature, commercial geography, political economy, visits to workshops.

The manual training consists of carpentry, turning, and metal work, all pupils taking turns at each, quarter after quarter. No effort is made to apprentice the pupil for any one of these, the object being simply to create a proficiency in a general way in manual work, to give the pupils some ideas for choosing their professions, and as a complement to the instruction in drawing. The school possesses a complete outfit of looms, materials, and accessories for theoretical and practical instruction in silk manufacture for such pupils as desire to enter into that branch of industry.

The class instruction, particularly in mathematics, is carried on according to a peculiar method called the *Méthode Tabareau.* The idea of this system is to obtain from the whole class simultaneous work, and to execute immediately, under the eyes of the pupils, the correction of the same; to assure a constant attention by a special system of interrogations addressed to each pupil and to all at the same time. Each pupil has a blackboard, chalk, and an eraser. The problem or question is given by the teacher, and all work out the same problem or write the answer to the same question simultaneously. After a specified time all must stop work, when the work is examined and

the corrections explained to all pupils. This system allows no lagging and compels each pupil to be constantly active. It creates an enthusiasm for quick, careful work, which in business life is very advantageous.

In drawing, also, a peculiar method is adopted, that of Dupasquier. Pupils never copy drawings. The pupils are ranged in a circle around a model in such a way that the perspective is different for each pupil. The models consist of plane figures represented by wire, then cubes, cylinders, columns, and finally complete machinery. The drawings are executed in chalk on blackboards, and in pencil, ink, and water color on paper.

In chemistry the instruction is theoretical and practical and comprises both the mineral and organic, with the applications to the various industries, particularly dyeing.

In the courses in physics and natural sciences the lessons are accompanied by the exhibition of apparatus or samples, or by drawings on blackboards.

COURSE OF STUDY FOR BOYS IN LA MARTINIÈRE SCHOOL, LYONS.

Subject.	Hours per week.						
	Preparatory class.	First year.			Second year.		Third year.
		Section 1.	Section 2.	Section 3.	Section 1.	Section 2.	
Bookkeeping					2	2	2
Calculation	6¼						
Chemistry		2	2	2	6¼	6¼	6¼
Drawing	10	10	10	10	10	10	12
English					3	3	4
Geography	1						
Grammar	4	5	6¼	5	4	4	4
History	1	2	2	2½	2	2	2½
Mathematics	8¼	9	9¼	9	8¼	8¼	8
Penmanship	3	3½	3	3			
Physics		2½	2	2½	1	1	2½
Political economy							1
Reading	3						
Science					1	1	
Shop work	1	3½	3	3¼			
Shop work or weaving					3	3	3
Total	37½	37½	37½	37½	40½	40½	44¾

The attendance of each section is from 80 to 100 pupils.

The graduates of the school at once obtain positions, as the applications of employers for young men exceed the number of graduates. The proportion of offers for employment is as follows: For commerce, 85 per cent.; engineers, architects, or mechanics, 7 per cent.; chemical industries, 1 per cent.; various industries, 7 per cent.

Instruction is gratuitous. The school admits only day pupils. The age of candidates must be 13 years for the school proper, and 12 years for the preparatory class. About 300 pupils are admitted annually by competitive examination in such branches as are taught in the elementary primary schools. About one-third of this number falls out at the end of the first year and about one-half of the remainder at the

end of the second year, either for voluntary reasons or on account of incompetence.

The administration of La Martinière School is carried on by a committee of seven members named by the municipal council of Lyons. The mayor of Lyons is *ex officio* president of the committee and chooses the active president, vice-president, and secretary of the committee.

The administrative committee (or board) prepares the budget to be submitted to the municipal council, makes and revokes all appointments except that of the director, fixes salaries, prepares the plans of study, programmes, and regulations, and discusses all questions relating to the school. The director of the school is named by the mayor of Lyons. The members of the committee are generally the most prominent men of the city engaged in commerce, industry, or science.

A jury composed of merchants, manufacturers, artists, and professors, none of whom are directly connected with the school, conduct the final examinations, after which generally 50 or 60 diplomas are annually distributed.

In 1885-'86 the receipts from interest on donations and bequests aggregated 150,216¼ francs ($28,991.74). Of this sum the General Martin fund yielded 110,169 francs ($21,262.62); others, 40,047¼ francs ($7,729.12).

This school is under the direction of M. Lang, and is unquestionably the best normal training school in France.

Complete statistics of the occupations taken up by the students and graduates of this school have never been gathered. The experience of the director, which covers nearly twenty years, is that 25 per cent. only pursue some technical vocation for a livelihood. The rest drift into commerce in one capacity or another.

There is probably a reason for the low percentage of those entering industry in the fact that Lyons is above all a city given up to commerce in silk. A very large number of graduates enter some of these silk houses in one capacity or another.

DIVISION FOR GIRLS.

This division of the school aims to give to girls of working people an apprenticeship in a trade, and at the same time a general education. It differs in this respect from the division for boys.

General instruction comprises penmanship, grammar, history and geography, mathematics, physics, chemistry, drawing, domestic economy, and manual work. The class exercises are conducted according to the same peculiar methods as in the division for boys, and, in most cases, by the same teachers.

The special instruction includes four branches, or sections, as follows:

Section of commerce: Special subjects, penmanship, bookkeeping, and English.

Section of industrial drawing: Drawing with practical applications

for industries, preparing cards for looms, composition of designs, lithography, etc. A subdivision of this section covers embroidery for garments, furniture, church ornamentation, etc.

Section for ladies' tailoring: Sewing by hand and machine, cloak and dressmaking (taking measurements, cutting, and finishing), and all that relates to a complete apprenticeship of the trade of ladies' tailoring.

On being admitted pupils have the option of choosing their professions. The apprenticeship is for three years. All pupils must take the general course of instruction, and none can do that without at the same time following one of the special courses.

The following table shows the hours per week given to the various branches of instruction in the several courses:

COURSE OF STUDY FOR GIRLS IN LA MARTINIÈRE SCHOOL, LYONS.

Subject.	Hours per week.											
	Commercial.			Embroidery.			Industrial drawing.			Ladies' tailoring.		
	First year.	Second year.	Third year.	First year.	Second year.	Third year.	First year.	Second year.	Third year.	First year.	Second year.	Third year.
Bookkeeping	4	4	6	.....	.....	.....	.....	.....	.....	.....	.....	.....
Chemistry	.....	.....	1	.....	.....	1	.....	.....	1	.....	.....	1
Domestic economy	.....	.....	1	.....	.....	1	.....	.....	1	.....	.....	1
Drawing	2	2	2	9	12½	9	19½	19½	2	2	2	2
Embroidery	.....	.....	.....	10½	16	10½	.....	.....	.....	.....	.....	.....
English	8	11	7½	.....	.....	.....	.....	.....	.....	.....	.....	.....
Grammar	5	5	4	5	5	4	5	5	4	5	5	4
History and geography	3	3	3	3	3	3	3	3	3	3	3	3
Mathematics	3	3	3	3	3	3	3	3	3	3	3	3
Penmanship	4	2	3	2	1	1	2	1	1	2	1	1
Physics	.....	1	.....	.....	1	.....	.....	1	.....	.....	1	.....
Sewing	3	2	2	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sewing (tailoring)	.....	.....	.....	.....	.....	.....	.....	.....	.....	10	10	10
Tailoring	.....	.....	.....	.....	.....	.....	.....	.....	.....	7½	7½	7½
Total	32	33	32½	32½	41½	32½	32½	32½	15	32½	32½	32½

There are also classes in ironing on Mondays and Fridays.

The attendance at the close of the year 1891 was 85 pupils in the first year's class, 50 pupils in the second year's class, and 35 pupils in the third year's class. Several who have passed through the school remain for further practice, in addition to the above.

Pupils who complete the courses of instruction satisfactorily receive diplomas. The administration of the school interests itself in finding positions for such graduates. They find employment very easily, as a rule, in occupations for which they have been trained.

Pupils are admitted at the age of 12 years, upon leaving the primary schools. Instruction is gratuitous. The work done is for patrons, or is sold. Graduates who desire to continue their practical education may bring their own work with them, perform it under the supervision of the teacher, but retain the same for their own benefit or use.

This school is under the same management as the division for boys. The principal of this school has the rank of assistant director.

INSTITUTION LIVET, NANTES.

This institution was founded in 1846 by M. E. Livet, the present proprietor. It has for its object the training of young men, destined for commercial and industrial pursuits, for the marine, and for the public and private administrative service.

The instruction is given to three divisions of pupils, as follows: The preparatory division, for pupils from 6 to 8 years of age, requiring two years; the elementary course, for pupils from 8 to 12 years of age, requiring four years; the division for professional instruction, for pupils of 12 years and over, requiring five and six years.

The first two of these divisions include such studies as are taught in the primary schools, special features of the former division being object lessons, and of the latter division, drawing and modelling.

The instruction given to pupils of the professional division comprises such studies as are taught in the advanced primary schools of France, together with technical branches. This division is again subdivided into two principal sections—one for commerce, and the other for the industries.

Following are the studies taught in each of these two sections, with the number of hours per week devoted to each:

COURSE OF STUDY IN THE INSTITUTION LIVET, NANTES.

Industrial section.

Subject.	Hours per week.				
	First year.	Second year.	Third year.	Fourth year.	Fifth year.
Ethics	1	1	1	1	
French language	4	3	3	2	
Literature	3	2	2		
History and geography	4	3	3		
Mathematics	8	8	8	6	
Mechanics				2	
Physics and chemistry	2	3	4	2	
Study of steam engines				8	
Natural history	1				
Bookkeeping	1	1			
Calligraphy	2	1	1		
English language	2				
Linear and ornamental drawing	4	6	8	6	
Artistic designing	3	3	3		
Shop work	4	10	10	17	
Total	39	41	43	44	

COURSE OF STUDY IN THE INSTITUTION LIVET, NANTES—Concluded.

Commercial section.

Subject.	Hours per week.					
	First year.	Second year.	Third year.	Fourth year.	Fifth year.	Sixth year.
Ethics	1	1	1	1	1	1
French language	5	3	3	2	1	1
French literature	3	3	4	4	5	6
History and geography	3	3	3	4	3	3
Mathematics	6	6	7	6	7	8
Mechanics	.....	.....	.....	.....	2	2
Physics and chemistry	2	3	3	4	4	6
Natural history	1	1	1	1	2	2
Chemical manipulations	.....	.....	.....	.....	3	3
Legislation	.....	.....	.....	1	1	1
Commercial accounting and bookkeeping	2	4	5	1	1	1
English language	4	4	5	5	5	5
German language	3	3	.....	3	3	3
Calligraphy	2	2	1	.....	.....	.....
Linear drawing	3	4	4	4	2	.....
Artistic designing	3	4	4	2	2	.....
Vocal music	1	1	1	1	.....	.....
Shop work	.....	.....	.....	3	.....	.....
Total	39	42	42	42	42	42

The professional division also comprises a section for engineers for the marine service, a school of watchmaking, and special classes in which pupils are prepared for the national schools of arts and trades, the schools of fine arts, the schools of architecture, schools of agriculture, veterinary schools, and the school of mines at Saint-Etienne.

The pupils of the section for engineers for the marine service pass four hours per day at the workshops; the rest of the time is exclusively devoted to the study of drawing and other subjects useful for the profession, French language, English language, industrial economy, pure mathematics (arithmetic, algebra, etc.), and applied mathematics (mechanics, physics, etc.). Several special professors are employed for this section. The final examinations of this section are conducted and the prizes awarded by a board appointed by the minister of marine and of the colonies. This gives official recognition to the examinations, and graduates are eligible to the grade of student engineers of the navy.

In the watchmaking school, which has existed since 1878, the pupils are occupied four hours per day at practical watchmaking. The rest of the time is devoted to theoretical studies, principally mechanics.

Pupils preparing for the other schools mentioned above take the regular professional course of study, with such slight variations in manual and theoretical work as will fit them for the required examinations.

A gymnasium is attached to the school for the use of pupils, and military exercises are given according to government regulations.

The linear drawing of the industrial section is at once theoretical and practical. Pupils are taught in drawing geometrical plans, tracing, executing plans of machinery (often very complicated) of which

they previously make sketches from the models, being instructed at the same time in the uses of the different pieces. All objects are drawn from nature either in the shops of the school or of city establishments, or from casts or patterns.

The course comprises also architecture, applied building construction, ships, etc.; it permits the graduate to take a position in an establishment for construction of machinery, in an architect's office, etc.

The workshops, covering 800 square metres, are completely furnished with tools and machinery, a steam engine, etc., and comprise a shop for fitting (mechanics), one for turning, one for foundery work, and one for carpentry and patternmaking. There is also a special hall for clay modelling. Special teachers are employed for each of these shops.

The attendance averages about 600 pupils, most of whom are in the professional division.

The tuition per year is as follows:

For boarders: Preparatory division, 600 francs ($115.80); elementary division, 700 francs ($135.10); professional division, 800 francs ($154.40).

For day boarders: Preparatory division, 300 francs ($57.90); middle division, 350 francs ($67.55); superior division, 400 francs ($77.20).

For pupils without any board: Preparatory, 100 francs ($19.30); 120 francs ($23.16); 150 francs ($28.95).

Sixty francs ($11.58) per year, extra, is charged for manual training, from 12 to 30 francs ($2.32 to $5.79) per year for class and drawing materials, 2 francs (39 cents) for military exercises and gymnasium.

The course in watchmaking costs 200 francs ($38.60) per year for instruction, and 50 francs ($9.65) for materials.

Pupils must, upon being admitted, present their certificates of birth, vaccination, and good conduct. Candidates pass examinations according to the grade which they desire to enter.

The school is entirely private, being supported by tuition fees. A slight income is derived from the sale of tools, machinery, etc., made by the pupils. Some free scholarships were created by subsidies from the ministries of public instruction, of the marine, and of commerce, industries, and the colonies of the national government, and from some of the neighboring departments.

The administration of the school is in the hands of M. Livet and his assistants. There are 21 teachers in the middle and superior divisions, and 6 teachers in the preparatory division, for class instruction; 5 specialists, for technical instruction; 6 overseers, and 9 instructors for optional branches, as music, fencing, dancing, etc.

OCCUPATIONS OF EX-STUDENTS OF THE INSTITUTION LIVET, NANTES.

Year.	Industrial occupations.		Commercial occupations.		Government service.		Students veterinary school of agriculture.	
	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.
1875	20	42.5	21	44.7	6	12.8	.....	.....
1876	21	48.8	15	34.9	5	11.6	2	4.7
1877	21	36.2	27	46.6	10	17.2	.....	.....
1878	19	39.6	23	47.9	6	12.5	.....	.....
1879	29	45.3	28	43.8	7	10.9	.....	.....
1880	23	49.0	24	45.3	3	5.7	.....	.....
1881	32	45.1	26	36.6	11	15.5	2	2.8
1882	37	52.9	26	37.1	6	8.6	1	1.4
1883	29	42.7	28	41.2	9	13.2	2	2.9
1884	32	49.2	25	38.5	7	10.8	1	1.5
1885	38	50.0	32	42.1	4	5.3	2	2.6
1886	44	47.8	38	41.3	6	6.5	4	4.4
1887	58	52.7	44	40.0	5	4.6	3	2.7
1888	65	50.4	51	39.5	8	6.2	5	3.9
1889	67	50.0	54	40.3	9	6.7	4	3.0
1890	66	49.6	56	42.1	7	5.3	4	3.0
1891	69	50.4	55	40.1	10	7.3	3	2.2
Total	673	48.1	573	41.0	119	8.5	33	2.4

APPRENTICESHIP IN FRANCE.

Although there exist a large number of schools especially devoted to trade education, it is still held by many to be the best course to apprentice children during a certain time to an employer who will instruct them in all the details of his trade.

The engagement of an apprentice is not, as in the case of a workman, terminable at pleasure. It is made for a definite time, and before its expiration it is illegal for either the patron to dismiss the apprentice or for the latter to leave his patron.

This contract which exists between the patron and the apprentice, represented by his parents, only becomes definite after two months. This period, called the time of trial, is accorded by law in order to permit each party to determine whether it is for his interest to continue the connection. These contracts are written by notaries, recorders of the *conseil des prud'hommes*, or by justices of the peace. They stipulate any conditions not in violation of the law of February 22, 1851, concerning apprentices, or that of 1874 on the employment of children in factories. Inspectors enforce the provisions of these laws. Any disputes which may arise, regarding the contract, are heard by the *conseil des prud'hommes*, or by a justice of the peace. If the dispute is over a verbal agreement the conditions are presumed to be those of local usage. Judgment for damages will run for thirty years.

The duration of apprenticeship is not always the same. The age, prior instruction, physical development, aptitude, and nature of the trade generally determine the duration. Local customs and habits of employers differ greatly on this point.

In all professions the workshop is the best place for apprentices to learn their trades, provided they receive proper attention and are not made mere errand boys; but there are many details of theory necessary

for a complete education which they are unable to receive in shops. Besides performing the work a workman should be able to put on paper the plans of the objects he executes. To enable apprentices to acquire this knowledge many employers have annexed appropriate courses of instruction to their industries.

TRADE SCHOOLS AT PARIS.

At Paris courses of this nature have been established by chambers of commerce of particular trades. They are completed by examinations, at which prizes are generally distributed. Loan libraries are also attached. Trades having such schools at Paris are:

(1) Jewellery: A trade school of design and modelling, founded by the organized company of jewellers and goldsmiths.

(2) Imitation jewellery: School of design and modelling, founded by the company of imitation jewellery makers.

(3) Bronze work: Special school of design and modelling founded by the company of bronze manufacturers.

(4) Coachmakers: Trade and artistic course of coachmaking for apprentices, founded under the patronage of the association of coach makers.

(5) Wheelwrights' trade: Trade school, founded by the association of wheelwrights.

(6) Boiler making: The association of boiler makers of France have established for the department of the Seine courses in boiler making, steam engines, and legislation concerning steam engines, in eight different quarters of Paris.

(7) Roofing and plumbing: Trade courses established by the association of plumbers, roofers, and zinc workers of the department of the Seine include instruction in sanitary plumbing, technology, hygiene of habitations, drawing, and practical courses in lead and zinc work.

(8) Roofing and plumbing: A course of theoretical and practical roofing and plumbing, established by the association of roofers and plumbers of Paris.

(9) Cabinetmaking: School of professional drawing, founded by the Industrial Patronage of Children in the Cabinetmaking Trade.

(10) Flower and feather work: The society for the assistance of children employed in the flower and feather trade have organized courses of instruction.

(11) Paper and cardboard manufacturing: Courses organized for instruction in the art by the association of paper manufacturers.

(12) Tapestry: Courses by the Patrons of Tapestry Apprentices.

(13) Carriage making: Technical courses organized by the association of carriage manufacturers.

There are also in existence in Paris four societies having for their object a general, in addition to a special, instruction of apprentices *and adults.* These societies have established numerous courses in

every quarter of Paris. The instruction is entirely gratuitous. Most of the instruction is devoted to literature, science, music, mathematics, languages, and elementary studies. The following technical subjects are also treated by the societies named:

(1) Society for Elementary Instruction (for girls and women only). Stenography, needlework, cutting and finishing garments, domestic economy, drawing and water color painting applied to industrial and decorative arts, ceramic painting, enamelling, painting on fans, modelling, and engraving and etching.

(2) The Polytechnic Association (for both sexes): Modelling, painting on porcelain and on fans, construction, technology, industrial metallurgy, steam engines, style in furniture, practical mechanics, classes for metal workers, classes for masons and stone cutters (stone cutting, geometry and practical drawing); for women only, cutting garments, sewing, millinery, and telegraphy.

(3) The Philotechnic Association (for both sexes): Technology, telegraphy, stereotomy, cutting, sewing, and finishing garments, cutting (for men's tailors), millinery, special courses for coppersmiths, fitters, firemen and mechanics and foundery workers, cutting and sewing shoes, photography, and industrial applications.

(4) The French Union of Young People (for both sexes): Industrial chemistry and physics, mechanics and applied sciences, stenography, embroidery and sewing, and drawing.

These courses are mostly given in the evenings or on Sunday mornings.

Considerable effort has been exercised, particularly in the last twenty-five years, to raise the standard of trade education in France. It has come from the side of labor organizations, industrial employers, transportation companies, private institutions, religious and associated benevolence. It would be exceedingly instructive to attempt a census of these activities, but lack of space forbids the attempt. Nothing more is possible here than brief mention of a few of the more prominent agencies.

GUTENBERG TYPOGRAPHICAL SCHOOL, PARIS.

This school was founded in 1886 under the patronage of the Printers' Union. The object is to educate young typographers. Pupils serve either a three years' apprenticeship at the school, or during apprenticeship at an establishment attend school two consecutive days weekly, or if desirous of perfecting themselves in any particular branch of work they frequent classes for any period they may desire, but not less than six months.

The school is open eight and a half hours daily throughout the year, and trade instruction absorbs six hours of this period. Twenty pupils are in attendance at one time. All of the 67 who have thus far graduated have entered into positions found for them by the Printers' Union.

Tuition is free to the first class of pupils, viz., those who serve a three years' apprenticeship at the school. A certificate of primary education is the principal and indispensable requirement of admission.

TRADE SCHOOL OF THE CHAIX PRINTING COMPANY, PARIS.

This school was founded by the company in 1863 with the object of educating skilled workmen for all branches of the company's service. The course extends over four years. This is one year more than is required for ordinary apprenticeships, as the scope of the work is much greater and much of the time is spent in class instruction.

Pupils must be at least 13 years of age to be admitted. They must be introduced by their parents or guardians and must produce the following papers: Their birth certificates; a certificate of primary education attested by the mayor; a certificate of release in case they are already apprenticed elsewhere. On entering the apprentices submit to an examination covering the primary branches. They are then assigned to such branches as they appear to be best fitted for. For compositors and lithographers the examination is competitive and takes place once every year. On an average the number of competitors is six times as great as the number of vacancies. Only ten pupils are received annually. One hour daily is devoted to instruction in the intellectual branches; the rest of the time is given up to manual instruction and practice. The theoretical work includes reading, writing, and composition in the French language, and such instruction as will impart an understanding of the letters, words, etc., of the English, German, Greek, and Latin languages, both printed and written; the letters, figures, signs, etc., of higher mathematics, besides class instruction in history, geography, mathematics, physics, punctuation and grammar, and theory of printing, all of which are directed especially to their practical application.

Pupils pay no tuition. On the contrary they are paid while serving this apprenticeship, according to the following scale: Compositors and lithographers, first six months, nothing; second six months, 50 centimes (10 cents) per day; during second year, 1 franc (19 cents) per day; during third year, 1 franc 50 centimes (29 cents) per day; during fourth year, 2 francs (39 cents) per day. Printers and others doing mechanical work obtain, during first four months, 75 centimes (14 cents) per day; second period of four months, 1 franc (19 cents) per day; third period of four months, 1 franc 25 centimes (24 cents) per day; after one year 1 franc 50 centimes (29 cents) per day, increasing 25 centimes (5 cents) per day every four months until the apprenticeship is finished.

The boys receive the pay of skilled workmen as soon as they graduate. Of the 250 who have been trained in this school since the beginning about 200 are now in the employ of the company as compositors,

lithographers, engravers, pressmen, book-binders, and office employés. During the past five or six years all beginners in the service of the company have been graduates of the apprenticeship school. No vacancies in higher positions, such as foremen, office employés, or other officers of the establishment, are filled by any others than graduates of the school. Nearly all the higher positions in the offices and workshops from the proprietor down are filled by graduates. All positions are open to them. Few of these workmen leave the service of the company, and then it is to accept positions of importance in other establishments or to become proprietors themselves.

The secretary, M. Berger, adds in regard to the effect of the school and its value to the company: "It has increased the quantity, quality, and artistic value of our work. All our student workmen are so much more valuable to us that we consider the heavy expense of maintaining a school with the necessary faculty of teachers, the materials, etc., as insignificant in comparison with the effects such instruction has upon the value of our workmen."

SCHOOL OF THE EASTERN RAILWAY COMPANY, PARIS.

This school (*École Professionnelle du Chemin de Fer de l'Est*) had its beginning in 1852, but the present organization dates from 1884. The object of the school is to produce skilled mechanics for the company's shops, and to afford the sons of its workingmen an opportunity to learn a useful trade. Admission to the school is not strictly confined to the sons of workingmen employed by the company, but by far the larger proportion of the students are such.

The course of instruction is for four years, and embraces reading, writing, spelling, grammar, history, geography, arithmetic, physics, chemistry, mechanics, design, and instruction in that trade for which the student shows preference and aptitude. Four hours each day are devoted to theoretical instruction and five hours to practical work in the company's shops.

The total number of students who have been and are now being instructed is 248, of whom about 200 have completed the course. Mechanics for the company's shops are entirely recruited from the graduates of this and other schools of the company, but no obligation rests on the student to enter the company's employ after having completed his course of instruction.

The school, including books and one meal (luncheon), is free to such as fulfil the requirements of admission, and, in addition, the students are paid a wage of 10 cents each school day, commencing with the date of their entrance into the school. This wage is increased 5 cents per day each six months if the instructor in the shops recommends it.

Applicants for admission must be 13 years old, and must have a certificate from an instructor that they have acquired the rudiments of in-

struction of a primary school. They must present a physician's certificate showing that they are physically able to follow a trade in the company's shops. They must also pass an examination in the rudiments of arithmetic.

Other schools, or special courses, are conducted by this company in the large workshops at La Villette, Romilly, Epernay, and Mohon.

TRADE SCHOOL OF THE NORTHERN RAILWAY COMPANY, PARIS.

Another practically similar school exists in connection with the Northern Railway. It was founded in 1883 and has been attended by about 170 students, two-thirds of whom have remained to graduate. Only sons of the company's employés are admitted. Results have been thoroughly satisfactory.

TRADE SCHOOL FOR TAILORS' APPRENTICES, PARIS.

This school was founded in 1881 by the Society of Tailors of Paris. The object of the school is to form good workmen, and to raise the standard of hand work, which had been greatly neglected since the introduction of the sewing machine.

The duration of the studies is for three years. The children receive, at first, an elementary idea concerning sewing, and gradually increasing the scope of work, they take part finally in the making of garments of all kinds.

The school is in session ten hours per day. One hour is devoted to primary instruction, and the rest to practical work. The pupils are organized into groups of four or five apprentices, each group having its own instructor. The articles made, such as suits, coats, overcoats, etc., are never transferred from one place to another, but remain in the same group from the beginning until they are finished. Care is taken to give each apprentice experience in every detail of the work. The work is all done by hand until the end of the third year, when machine work is done.

The school began in 1881 with 8 apprentices and 2 instructors; in 1891 there were 40 apprentices and 8 teachers. About 180 young men have finished their apprenticeships, and are all occupied in the profession.

Tuition is gratuitous to the children of poor parents; those in better circumstances must pay a fee.

The apprentices receive a compensation of 1 franc (19 cents) per week the first year, 2 francs (39 cents) the second year, and 3 francs (58 cents) the third year, but these amounts are retained until the end of the apprenticeship, when they are paid out in full. The compensation is, however, only paid when the work and conduct of the pupil has been entirely satisfactory during the week. In addition to the above ap-

prentices of special merit receive every Saturday 25 to 75 centimes (5 to 14 cents) pocket money. The pupils lunch at the school, the meals being furnished gratuitously.

The school is maintained and administered by the Association of Tailors of Paris.

TRADE SCHOOL FOR WATCHMAKING, PARIS.

The school for watchmaking at Paris was founded as a private institution in 1880. The object of the school is: To form proficient workmen in the various branches of the manufacture of watches, clocks, and timepieces of precision; to give a good professional and scientific instruction to young men, who desire to practise the art of watchmaking; to give an opportunity to young workmen and apprentices, who have already served an apprenticeship, to perfect themselves theoretically and practically in certain parts of the trade, in regulating, in adjusting, and in repairing.

The period of apprenticeship is four years. Theoretical instruction is given for three hours daily except Saturdays, and shop work occupies seven hours daily.

Sixty-six pupils are at present in attendance. Two hundred and fifty-five have graduated, all of whom have found technical employment.

Pupils must be 13 years old to be admitted and possess the certificate of primary instruction. Young men and workmen who have served an apprenticeship of at least two years in another watchmaking school and such workmen as desire to perfect themselves in specific branches may be admitted for one year or longer.

The tuition is 300 francs ($57.90) per year.

An excellent municipal watchmaking trade school at Besançon and a private institution at Ault with the same end in view hardly need special description after what has already been given for the schools at Cluses and Paris.

SCHOOLS OF THE SOCIETY FOR THE INDUSTRIAL EDUCATION OF WOMEN, PARIS.

The first of these schools was founded in 1864 by the Society for the Industrial Education of Women at the initiative of Madame Elisa Lemonnier. It was the first industrial school for girls in France. The object of the school is to give to girls such instruction as will enable them to gain an honorable living.

The instruction does not differ much from that of the industrial schools for girls maintained by the city of Paris. The courses of instruction comprise three years. They are divided into general and special courses.

The general course comprises: French language, arithmetic, geometry, history and geography, applied sciences, writing, and a course in

cutting. This instruction is given from 8.30 to 11.30 a. m. The special or professional courses of study are as follows:

COMMERCIAL COURSE.

Elements of bookkeeping, keeping the principal and auxiliary books, penmanship, balances. Business forms, invoices, statements, receipts, acquittances. Review of the principles of bookkeeping, complex business operations, balances, inventories, balance sheets. Studies of the effects of commerce. Calculations of commercial interest, discount, current accounts. General bookkeeping. Opening and closing sets of books. Foreign money calculations. Commercial and civil law. German and English languages.

SEWING.

Plain sewing, such as is done by all the pupils of the schools. During the first year elementary work in sewing. The work of the second and third years includes two ladies' dresses and one child's costume. Exercises in cutting, fitting, and trimming, repairs, various kinds of work, infant clothes, etc.

INDUSTRIAL DRAWING.

Geometrical drawing (descriptive and perspective). Drawing from copy; from nature. Anatomy. History of art. Decorative composition (in copybooks, albums, and frames).

PAINTING.

Painting on china: decorative panels (composition and execution done by the pupils), flower pots, vases, dishes, and various objects.

Painting on enamel: enamelled household articles, trays, fancy boxes, etc.

Painting on porcelain: cups, plates, plaques, etc.

Painting on silk: fans, screens, etc.

Painting on wood: boxes, etc.

Painting on glass: church windows, etc. (the design and execution done by the pupils).

Painting on ivory: miniatures.

WOOD ENGRAVING AND CARVING OF VARIOUS KINDS.

EMBROIDERY.

Embroidery: plain, in silk, in gold, etc., on dresses, drapery, pincushions and various objects; composition and embroidery done by the pupils.

The instruction for the special courses is given from 12.30 to 5.30 p. m.

The attendance in 1891 was as follows: The first school, 200 pupils; the second, 110 pupils; and the third, 190 pupils.

The society occupies itself also as much as possible in finding positions for the pupils who leave the school.

The tuition is from 12 to 15 francs ($2.32 to $2.90) per month. Free scholarships are also given. The age of admission is at least 12 years.

The Ternes Industrial School for young women and the Protestant Industrial School for young girls at Paris are quite similar to those belonging to the Society for the Industrial Education of Women, though of not quite the same importance.

TRADE SCHOOL OF THE INDUSTRIAL SOCIETY OF SAINT-QUENTIN.

The trade school of the Industrial Society of Saint-Quentin was opened in 1884 with the object of forming workmen, foremen, and technical directors for the principal industries of the neighborhood. The period of instruction is three years. Manual work includes wood work and iron work and the construcion of machinery used in spinning, weaving, and sugar making. The theoretical instruction includes the usual branches with special attention given to drawing and mathematical calculation of work to be executed.

The present attendance numbers 77. The 70 graduates since the school was founded immediately found suitable technical employment in the vicinity. Instruction is gratuitous and candidates for admission are received between the ages of 12 and 16 years.

Special industrial classes are held by the Industrial Society for work people of both sexes. They comprise instruction in hand and power loom weaving; embroidery; needlework; industrial chemistry; elementary physics; practical sugar refining; practical mechanics; industrial drawing, etc.; enlarging for mechanical embroidery; drawing and designing for the various textile fabrics; English language; German language; bookkeeping; industrial drawing; agriculture; and application of chemistry to fertilizing.

The following table shows the distribution of classes and the attendance (January 1892):

ATTENDANCE AND COURSE OF STUDY IN THE CLASSES OF THE INDUSTRIAL SOCIETY OF SAINT-QUENTIN.

Subject.	Hours.	Attendance.
Weaving, simple	Daily from 7 a. m. to 5 p. m	69
Weaving, power loom		28
Weaving, special, for foremen	Sundays 11 a. m. to noon	Varies.
Needlework, linens, embroidery, dresses, etc	Daily, 8 a. m. to 6 p. m	1,268
Mechanical embroidery	Daily, 7 a. m. to 7 p. m	29
Practical mechanics	Lectures delivered to workingmen on certain evenings.	Varies.
Elementary physics		Varies.
Industrial chemistry		Varies.
Agriculture		Varies.
Heat	Sunday mornings	19
Preparing cards for various textiles	Daily, 9 a. m. to noon and 2 to 5 p. m.; also special evening classes.	18
Designing and enlarging for mechanical embroidery		72
Industrial drawing		15
Political economy		61
Geography, commercial		Varies.
English language		Varies.
German language	Instructions to workingmen at times most convenient—evenings or Sundays.	44
Commercial law		62
Practical sugar refining		Varies.
Weaving (at Bohain, a suburb)		26
Industrial drawing (at Bohain)		49
Bookkeeping (at Bohain)		39
Industrial drawing (at Chauny)		29
		40

For those courses of instruction which continue all day pupils need only attend at such times as they can afford to be absent from their daily work.

Persons in attendance are for the most part workmen who are occupied in gaining a livelihood, and who visit the classes, whenever time per-

mits, in order to perfect themselves in their own trade or to learn a new one if they find themselves adapted for it. Thus it happens sometimes that unskilled workmen or laborers acquire a skilled profession such as weaver, master weaver, embroiderer (mechanical), draughtsman, etc., simply by making good use of their leisure time.

All these special courses are absolutely gratuitous and are open to all who desire to avail themselves of their benefits. On the other hand, persons who excel in their respective classes are liberally rewarded with prizes of money, books, medals, etc.

These courses, as well as the professional school of the society, are under the direction of a board of administration consisting of the mayor of the city, the president and last ex-president of the chamber of commerce, who are *ex-officio* members, and five elected members of the society. Each course has a special committee of surveillance elected from among the members of the society. The courses are supported chiefly by regular dues of the members of this philanthropic society, and by city, state, and department subsidies.

At Reims, Lyons, and Nantes industrial societies maintain courses of instruction. All these institutions are very similar to those at Saint-Quentin, already described. Their work is highly appreciated and excellent results are attained. At Lyons 8,012 persons attended the classes of the Society for Trade Instruction of the Rhone in a single year.

SCHOOL OF APPRENTICES OF THE INDUSTRIAL SOCIETY OF NANTES.

In this school the instruction is given one hour every morning before the apprentice goes to the workshop. His term of apprenticeship is therefore lengthened to four years instead of three, as is the local custom.

A unique feature of the School of Apprentices of the Industrial Society of Nantes are the conditions made by contract when the apprentice is admitted. The pupils are indentured as apprentices at some establishment. The contract of apprenticeship is tripartite, between the president of this society, the employer, and the parents of the boy. The Industrial Society pays each pupil during the continuance of this contract 3 francs (58 cents) per month, of which one-half is put away as savings for the boy, and the other half may be given to the parents. In addition 6½ pounds of bread are furnished per week to those in need. The society has surveillance over the pupil, also at the workshop, and any breach of contract on the part of the apprentice, either against the employer or the school, may be punished by imprisonment of the apprentice or by a reimbursement with interest to the society for the expenses to the school caused by the apprentice. The materials for instruction are furnished gratuitously by the society.

ADVANCED SCHOOL OF COMMERCE AND WEAVING, LYONS.

This school was founded in 1872 by the Society of Industrial Sciences of Lyons. The division for weaving was organized in 1877.

The object of the division for weaving is to give a practical and theoretical education to such persons as desire to occupy the higher positions in weaving establishments. This divison is entirely separated from the division for commerce. The course is for one year only.

COURSE OF STUDY IN THE DIVISION FOR WEAVING OF THE ADVANCED SCHOOL OF COMMERCE AND WEAVING, LYONS.

Subject.	Hours per week.
Theory of weaving (four parts)	24
Practical work (pupils pass three months in each shop)	15
Applied mechanics—study of motors and looms	1
Study of textile materials—bleaching, dyeing, finishing, etc	1
Designing patterns, etc., and preparing cards	2
Bookkeeping	1
Total	44

The school possesses 14 hand looms, 8 power looms, 7 preparatory machines, and a gas motor.

The practical instruction is given by foremen under the direction of the professors, and the theoretical instruction by special professors.

During the last three months the pupils, conducted by their professors, visit weaving, dyeing, and other similar establishments.

The school is in session from 8 to 11 a. m., and from 1.15 to 5.15 p. m.

The candidate for admission must be at least 16 years of age, and must pass an examination. Foreigners may also be admitted.

The administration of the school is in the hands of a board appointed by the Society of Industrial Sciences and by the chamber of commerce of Lyons. The annual expenses of this school amount to 116,000 francs ($22,388).

SCHOOL OF INDUSTRIAL CHEMISTRY, LYONS.

The School of Industrial Chemistry was founded in 1883 under the patronage of the Lyons chamber of commerce.

The object of the school is to give instruction in the theory and practical application of chemistry to such young men as desire to adopt industrial pursuits in which such knowledge is necessary. This is particularly the case in the textile industry in the vicinity of Lyons.

The duration of these studies is two years. The instruction is both oral and by means of laboratory work. The best pupils, generally a very small number, are retained one or two additional years for original researches.

The oral lessons or lectures consist of organic, inorganic, and indus-

trial chemistry, mineralogy, physics applied to chemistry, and experimental mechanics.

The laboratory work is carried on every day in inorganic chemistry during the first year and in organic chemistry during the second. Visits for practical study are paid to industrial establishments in the vicinity. Special attention is paid to such laboratory work as is most useful to the pupils for their future vocations. The school is in session from 6.30 to 11.45 a. m., and from 2 to 5.45 p. m. All the time not required for class instruction is devoted to laboratory work.

The attendance in 1890 was 28 pupils. The young men who graduate find positions very easily, and in many cases are engaged in advance.

CHURCH SCHOOLS FOR INDUSTRIAL EDUCATION.

The Society of Christian Brothers has industrial schools in the following cities: Paris—the Saint-Nicolas School (manual apprenticeship); Lyons—the La Salle School (manual training); Saint-Etienne—School of Manual Apprenticeship.

They are doing excellent work. The La Salle School has an attendance of 172, picked out from the most promising pupils in the Catholic schools of Lyons. The Saint-Nicolas School is attended by 250 pupils annually. A combination of shop apprenticeship and school attendance constitutes one unique feature of this institution as well as of the school at Saint-Etienne. The great majority of graduates take up technical vocations.

SECONDARY INDUSTRIAL SCHOOLS.

NATIONAL SCHOOLS OF ARTS AND TRADES, CHÂLONS, ANGERS, AND AIX.

The first of these schools was founded as a private institution in 1780 on the estate of a nobleman. It became a national institution during the first republic, and was removed to Châlons-sur-Marne in 1806. The second was organized at Beaupréau in 1804 and removed to Angers in 1815. The third was founded in 1843 at Aix. A law passed in 1881 directed the construction of a fourth, which is now being completed at Lille.

These schools have for their object the instruction of students in the mechanical arts, and such other branches as will enable them to become superintendents and masters of workshops and industrial establishments.

The three schools have the same programme and regulations. The studies are for three years. No person can remain a fourth year unless, on account of sickness or another unavoidable cause, he was absent more than six weeks.

Theoretical and practical instruction is given. The following table shows the theoretical branches taught and the number of lessons devoted to each:

COURSE OF STUDY IN THE NATIONAL SCHOOLS OF ARTS AND TRADES AT AIX, ANGERS, AND CHÂLONS.

Subject.	Number of lessons.					
	First year.		Second year.		Third year.	
	First half.	Second half.	First half.	Second half.	First half.	Second half.
Algebra	15	10				
Arithmetic	5					
Chemistry				8	20	24
French	20	18	14	20	14	15
Geometry	30					
Geometry, descriptive		37	40			
History and geography	19	17	14	19		
Industrial accounting					14	12
Kinematics				35		
Land surveying and cosmography.	7					
Land surveying and levelling.			5			
Mathematics, supplementary notions of.			15			
Mechanics					60	45
Physics			20	20		
Trigonometry		20				
Total	96	102	108	103	108	96

These studies include elements of analytic geometry, descriptive geometry, theoretical and applied kinematics, pure and applied mechanics, industrial application of physics and chemistry, drawing, industrial applications; technology, application to the construction of machines; accounting and elements of industrial economics and industrial hygiene.

The practical instruction is given in the following workshops: Carpentry and patternmaking, foundery, fitting, forging, and coppersmithing.

The first three months the pupils work in the different shops. After that time they are permanently placed in the shops for which they are best fitted. During the last year, however, they are again placed in the different shops for a short time to get a better general knowledge of practical work. In this way they work at their own particular professions a little over two and a half years.

These schools each admit 100 pupils every year who board at the schools. Since 1885 pupils who board outside the school may also be admitted.

Over 4,000 pupils have graduated from these schools. Nearly all of these occupy important positions in the various industries and in the government service. A society of former pupils has existed since 1846. Its aim is to find occupations for graduates, to maintain a fraternity among them, and to publish articles on technology, science, and industrial arts written by its members. A list of the occupations of members of this society is given in another part of this report.

The instruction is gratuitous. The price for board is 600 francs ($115.80) per year. A sum of 75 francs ($14.48) for incidental expenses is paid upon entering. The cost of the uniform and clothing outfit is fixed at 300 francs ($57.90).

The state provides a scholarship for the payment, either entirely or in part, of the board of pupils who have not the necessary means. In certain cases the expenses for the clothing outfit is paid by the state.

The admission to the school is by competitive examination. Pupils must be between 15 and 17 years of age at the time of the examination for admission, and must be of French parentage.

Following are the branches in which the candidates are examined: Penmanship; French grammar and orthography; arithmetic, theoretical and practical; elementary geometry; algebra, to equations of the second degree; history of France and geography, as taught in the high schools.

The following exercises are also included: A dictation, with the definition of the words, and a grammatical and logical analysis; a lineal design, and a pen and ink ornamental design; two problems in arithmetic and two in geometry; one piece of wood work and one piece of iron work, to test the manual skill of the candidate.

These institutions are under the jurisdiction of the minister of commerce and industry, and are maintained entirely by the state. The interior affairs are administered by a director, with the concurrence of a board composed of the professors and chiefs of the workshops.

The expenses of the three schools during 1890 were as follows:

Materials and Sundries.

Châlons	$48,809.31
Aix	41,848.58
Angers	40,622.06
Total	131,279.95
Expenses at Paris on account of these schools	1,421.83
Expenses on account of examinations for admission	3,121.00
Prizes and compensations to best pupils	4,342.50
Grand total	140,165.28

OCCUPATIONS OF GRADUATES OF THE NATIONAL SCHOOLS OF ARTS AND TRADES AT AIX, ANGERS, AND CHÂLONS.

Industries and occupations.	Number.	Industries and occupations.	Number.
Army service:		Building:	
General	1	Architects	44
High commissioned officers	3	Building materials—brickwork, cement, ceramics, lime, mosaics, paints, plaster, quarries, slate, tiling, timber:	
Lower commissioned officers	17	Manufacturers, merchants, and employés.	49
Non-commissioned officers and soldiers	35	Education:	
Bridges and metallic constructions:		Directors, engineers, professors of instruction, chiefs and assistant chiefs of workshops, and curators.	61
Proprietors, managers, and engineers	47	Electric works:	
Chiefs of workshops and construction, draughtsmen, etc.	26	Constructors, directors, and engineers	45
Bridges, roads, etc.:		Chiefs and assistant chiefs of workshops, draughtsmen, etc.	29
Engineers and assistant engineers	5		
Superintendents and overseers	107		
Telegraph and telephone constructors	3		
Superintendents of mines, surveyors, experts, and managers.	16		

OCCUPATIONS OF GRADUATES OF THE NATIONAL SCHOOLS OF ARTS AND TRADES AT AIX, ANGERS, AND CHÂLONS—Continued.

Industries and occupations.	Number.
Engineers:	
Civil engineers	143
Consulting engineers and patent solicitors.	16
Mechanical draughtsmen	236
Gas works:	
Proprietors, engineers, directors of works, draughtsmen, etc.	45
Gas fitters	14
Insurance:	
Directors and agents	3
Mechanical construction works in general:	
Proprietors, managers, and engineers	365
Chiefs and assistant chiefs of workshops and construction, draughtsmen, accountants, etc.	340
Mercantile branches:	
Merchants and employés	74
Metal works, founderies and forges:	
Proprietors, directors, and engineers	210
Chiefs and assistant chiefs of workshops and factories, draughtsmen, etc.	125
Mines:	
Engineers, managers, and superintendents.	43
Mechanics, etc	6
Navigation—construction workshops:	
Proprietors, managers, and construction engineers.	11
Chiefs and assistant chiefs of workshops, foremen, draughtsmen, etc.	15
Navigation — commercial and military marine, maritime canals:	
Chief engineers	5
Marine officers and principal engineers	32
Engineers, inspectors and chief engineers, commercial marine.	11
First and second master engineers, engineers' apprentices, engineers on commercial vessels, etc.	129
Paper works:	
Proprietors, managers, and engineers	22
Mechanics and other employés	11
Constructors of materials for paper mills.	8
Powder and dynamite works, cannon founderies and arsenals, and tobacco works:	
Employés	42
Public officials:	
Collectors of revenues, and of alms	3
Government counsellor	1
Notaries, court presidents, judges, experts, and arbiters.	6
Inspector of child labor in manufactories and public establishments.	1
Secretary of mayor's office	1
Senators and representatives	4
Public works:	
Contractors, engineers, and foremen	119
Mechanics, draughtsmen, etc	16
Railways, road construction:	
Engineers, chiefs and assistant chiefs of sections and workshops, overseers, and draughtsmen.	162
Railways, plant and rolling stock:	
Engineers and assistant engineers	22
Chiefs and assistant chiefs of railway stations, offices, etc.	116
Locomotive engineers and firemen	29
Railways, offices and workshops:	
Engineers and assistant engineers in offices and workshops.	11
Chiefs and assistant chiefs of workshops and offices, and other employés.	59
Foremen, assistant foremen, finishers, fitters, repairers, etc.	41
Draughtsmen	40
Railways—inspection and control:	
Inspectors, sub-inspectors, controllers, and assistant controllers.	116
Spinning, combing, weaving, finishing, and dyeing:	
Proprietors, directors, engineers, and various higher occupations.	99
Manufacturers of laces, velvets, tulles, etc.	4
Constructors of materials, looms, stitching machines, and paper tubes.	15
Steam apparatus, and brass and copper work:	
Employés	89
Sugar works, refineries, and distilleries:	
Proprietors, managers, engineers, and heads of factories.	42
Mechanics, etc	6
Constructors of sugar works, refineries, and distilleries: managers, engineers, chiefs of workshops, foremen, and construction draughtsmen.	15
Various professions and occupations:	
Bankers	5
Dentist	1
Pharmacist	1
Proprietors and landlords	100
Representatives of various industries	53
Water works:	
Contractors for works of conveyance and distribution.	9
Managers, engineers, and agents	22
Miscellaneous:	
Proprietors, managers, engineers, and constructors of materials in the following industries:	
Agricultural machinery	18
Articles for travel, fans, saddlery	5
Artillery and arms	7
Artistic metal work—iron, copper, lead, and tin.	15
Bell founderies	2
Belting and straps of leather, cotton, and india-rubber.	16
Blacking, paints, and varnishes	2
Bottles, corks, bottle clasps, and siphons.	7
Brushes, etc	1
Cables and chains	1
Carpentry, sawmills, cabinetmaking, and patternmaking.	18
Carriages and wheels	7
Chemical products, salts, etc	14
Chemist	1
Chest making	1
Chocolates and conserves	2
Coal mines	8
Elevators	2
Engraving	3
Faucet founderies	9
Files	4
Food products	2
Founderies, bolt and nail forges, horseshoes, sad-irons, buttons, hooks.	28
Galvanizing	2
Gas ovens, and other ovens	5
Gilding, silver plating, nickel plating, and galvanizing.	6
Glass and crystal works	13
Grinders	5
Grindstones and emery paper	4
Hardware and tinware	21
Heaters, flues, and ventilators	26
Ice making and ice machinery	9
Locksmithing	18
Machinery, tools, stamps, and saws	28
Malleable iron works	7
Matches	6
Mills for flour and other foods	26
Motors, petroleum	1
Oil and grease, petroleum, soap, and candles.	9

OCCUPATIONS OF GRADUATES OF THE NATIONAL SCHOOLS OF ARTS AND TRADES AT AIX, ANGERS, AND CHÂLONS—Concluded.

Industries and occupations.	Number.	Industries and occupations.	Number.
Miscellaneous—continued.		Miscellaneous—concluded.	
Proprietors, managers, etc.—cont'd.		Proprietors, managers, etc.—conc'd.	
Publishing, printing, lithographing, heliographing, bookbinding, and photographing.	22	Velocipedes, carriages and wagons, tramways, and omnibuses.	23
Pumps and hydraulic motors	15	Watchmaking, goldsmithing, scientific and musical instruments, physical and surgical apparatus, etc.	12
Shoemaking	1	Wire mills	3
Springs and axles	2	Wire screens and other metallic cloth	2
Starch	3	Wooden ware	2
Tanning	6		
Tar and asphalt	1		
Tubes, copper or iron	8	Total	4,045

CENTRAL INDUSTRIAL SCHOOL, LYONS.

Two important institutions projected along practically the same line as the national schools of arts and trades are the Central Industrial School at Lyons and the Industrial Institute of the North of France at Lille. The former of the two just mentioned is of a somewhat higher grade. It is in fact to Lyons very much what the Central School of Arts and Manufactures is to Paris.

About 350 have graduated from the Lyons institution, and nearly all have chosen technical vocations. They are found principally as proprietors, managers, or employés in silk and velvet factories, chemical and iron works, paper mills, engineers on railway or road construction, etc.

INDUSTRIAL INSTITUTE OF THE NORTH OF FRANCE, LILLE.

This school is largely a technological institution. It was founded by the department of the north in the city of Lille. Its object is to fit civil engineers, managers, and superintendents for the workshops of the principal industries of the north of France.

The instruction is theoretical and practical, and includes lectures, designing, experiments and work in general, industrial and analytic chemistry, experiments in dyeing, work in shops, and numerous visits to industrial establishments in the region. A great part of the time is spent in the shops and laboratories. The programme of studies has special reference to industries of the neighborhood. Instruction in the textile arts is greatly developed at the institute. The lessons are accompanied by practical exercises in a large and well equipped shop, with machines of a sufficient variety to initiate the student into nearly all the operations belonging to the linen, cotton, or woollen industries.

The instruction is given in two distinct divisions—of technology (on the type of schools of arts and trades) and civil engineering (on the type of the Central School of Arts and Manufactures). Each course is *divided into* three sections—mechanics, spinning and weaving, and

industrial chemistry. The plan of studies is absolutely the same for all in the beginning; in the second year the specialization commences, and is accentuated in the third year.

The plan of studies for the section of mechanics has been devised with a view of specially preparing for the industries of machine construction, and for public works. The pupils of this division are particularly trained in drawing, fitting, carpentry, operations of taking plans, levelling and surveying.

The pupils of the section of spinning and weaving follow, in the second year, a special elementary course. During the last year they pursue a higher course relative to textile materials and the industries which they are to follow. The practical exercises of spinning and weaving commence in the second year, and are greatly extended during the last year.

The pupils of the section of chemistry commence, in the second year, the study of analytic and industrial chemistry. Later they study, in special advanced courses, the principles of industrial chemistry. They are trained in experiments. During the last year the greater part of their time is employed in practical work.

NATIONAL SCHOOL FOR TRAINING FOREMEN AND SKILLED MECHANICS, CLUNY.

The original design of the three national schools of arts and trades at Aix, Angers, and Châlons was to train skilled mechanics and foremen. In later years there has been an advance both in the character of the instruction and object sought to be accomplished. These schools now train, in reality, overseers and mechanical engineers.

The new institution at Cluny is meant to fill in the gap between the training given in the national schools at Armentières and at Aix, for example. It was only opened in September 1892, so it is impossible, as yet, to speak of results.

SUPERIOR INDUSTRIAL SCHOOLS.

The government of France maintains an elaborate system of technical schools from which to recruit the service in its various administrative departments, state manufactories and industries. These schools include: Army and navy schools, schools of agriculture and horticulture, schools of forestry, veterinary schools, schools for the postal and telegraphic services, various schools of navigation and seamanship, schools for engineers of naval vessels, a polytechnic school, a national school for bridges and highways service, schools of mines, and art schools connected with state manufactories at the Gobelins tapestry works at Paris, and also at Beauvais and at Sevres.

POLYTECHNIC SCHOOL, PARIS.

The principal object of this school is to educate technical engineers for service in the various departments of the government service. The course of study covers two years.

The instruction includes a great variety of subjects, as: Mathematics, two years; descriptive geometry, one year; stereometry, one year; mechanics and machinery, two years; physics, two years; chemistry, two years; geodesy and astronomy, one year; architecture, two years; military art, one year; history, geography, and literature, two years; German language, two years; drawing and water color, two years.

The studies are supplemented by visits to establishments in the city and the neighboring country.

Students upon graduating either go directly into the service of the state, or continue their studies in other state schools, such as the school of mines, the school of bridges and highways, etc. Graduates not going into the state service have no difficulty in getting employment in responsible positions.

All students board at the school. The price for board is 1,000 francs ($193) per year, and that of their outfit, 500 francs ($96.50). Numerous partial or entirely free scholarships are given. In 1889 there were 144 of these.

Candidates for admission must be between the ages of 16 and 21 years, and must be either bachelors of science, bachelors of special instruction, bachelors of letters, or must possess a certificate relative to the first proof for bachelor of letters. Numerous preparatory schools exist in various parts of France to fit students for admission to this school.

NATIONAL SCHOOL OF BRIDGES AND HIGHWAYS, PARIS.

This school is maintained to recruit the corps of government engineers of bridges and highways. Government students are taken exclusively from the Polytechnic School at Paris. In addition to these students the school receives also others as day students, young men who wish to obtain the same instruction, but who upon graduation do not enter the government service. Their situation is very similar to those of engineers of the school of arts and manufactures.

The course of instruction covers three years, as follows:

First year.—Applied mechanics (resistance and materials), road construction, mineralogy and geology, architecture (the employment of wood and iron in constructions—decoration of bridges), political economy, general principles of construction.

Second year.—Applied mechanics (hydraulics), construction (interior navigation), construction (bridges), steam engines, architecture (employment of wood and iron in constructions—decoration of bridges), administrative law.

Third year.—Construction (railroads), construction (maritime works), administrative law, fortifications. English and German languages are also required.

In each division the students are exercised in practical work, graphic work, drawing, sketching, manipulation, and testing of materials of construction, levelling, and laying plans for machinery, buildings, etc. Supplementary courses are also given in pisciculture, the operation of railroads, photography, electric telegraphy, etc. The instruction is entirely gratuitous.

Students not coming from the Polytechnic School must be 25 years old and must pass an examination for admission. This class of students is very small. A preparatory department for day students is also maintained by this school.

NATIONAL HIGH SCHOOL OF MINES, PARIS.

This school is maintained primarily to educate engineers for employment in the exploitation of state mines. For this purpose the students are recruited exclusively from the Polytechnic School. Independent of these, the school also admits a limited number of other students.

The duration of studies is three years. The instruction has for its object the imparting of knowledge concerning the exploitation of mines, the treatment of mineral substances, and the management of railroads. The following are the principal subjects taught:

First year.—Working of mines; general metallurgy (iron); analytical chemistry of the metalloids; industrial chemistry; mineralogy; animal paleontology; topography; designs and plans for exploitations; exercises in the analysis of minerals; exercises in mineralogy and paleontology; exercises in topography.

Second year.—Metallurgy (different metals); analytical chemistry (metals); geology and petrography; machines and resistance of materials; railroads; industrial economics; theses in metallurgy and machines; exercises in mineral analysis; exercises in petrography; industrial visits and geological courses.

Third year.—Applied geology; construction work; construction of machinery; legislation concerning mines; applications of electricity; artillery; analysis of theses; projects of thesis and of exploitation, machines, and metallurgy. Students of the third year must also follow a course in English or German.

In addition to visits to mines and industrial establishments and numerous excursions which students have to make in order to complete their education, they are required during vacation to make a stay of a month in a mining or metallurgical district of France or Belgium. On their return they must make a report on the places they have visited.

The instruction is entirely free. Students who are not graduates of

the Polytechnic School are admitted according to the following conditions:

(1) Day students who intend to become engineers or managers in the working of mines for private persons. Only four or five are admitted each year. They must be between the ages of 17 and 23 years and are selected by examination. They follow the same course as the government students, but are not given employment by the state upon graduating. When they finish they receive a diploma, and generally find employment as engineers in mines, metallurgical industries, the railroad service, etc. There are preparatory courses for entrance as day students.

(2) Foreign students are admitted by request of their governments. They must pass an examination.

(3) Free students are admitted on their own initiative, to follow all or part of the courses. They receive no title or diploma, and are not considered as regular students.

SCHOOL OF MINES, SAINT-ETIENNE.

This is a national school, intended to furnish managers and engineers. The organization and requirements are very similar to those mentioned in connection with the previous institution.

The average number of students admitted annually is twenty-five.

The administration does not guarantee positions to graduates. All, however, obtain positions without difficulty at salaries which commence at 1,800 to 2,400 francs ($347.40 to $463.20) per year and advance as they gain experience. The school furnishes also engineers to metallurgical and chemical establishments in France and foreign countries. In the metallurgical industry of the department of the Loire 32 out of the 56 managers and engineers are graduates of the Saint-Etienne School of Mines. Out of 372 engineers directly employed in private mines in France 278 are graduates of this school, 68 of the Central School of Arts and Manufactures at Paris, and 26 of the National High School of Mines at Paris.

The instruction is gratuitous. The conditions for admission are the same as for the Central School of Arts and Manufactures at Paris, with the additional requirement of a knowledge of chemistry.

SCHOOLS FOR MASTER MINERS, ALAIS (GARD) AND DOUAI (NORD).

These are practical schools, intended to educate master workmen for mines. The instruction is both theoretical and practical, and lasts two years. One-half of each year is given up to work in the mines, and the other half to special studies in the elements of mathematics, physics, chemistry, working of mines, designing, etc.

Pupils must be 16 years of age to be admitted to the Douai school and 18 to be admitted to the Alais school.

The state gives scholarships, preference being given to the sons of miners.

INDUSTRIAL SCHOOL FOR NATIONAL MANUFACTORIES.

The government maintains a school of decorative art and tapestry and a practical school of chemistry as applied to dyeing at the national manufactory of Gobelins, a school of decorative art at the manufactory of Beauvais, and a practical school of ceramics at the national manufactory of Sevres, to recruit the service at these state establishments with artisans possessing technical artistic skill.

CENTRAL SCHOOL OF ARTS AND MANUFACTURES, PARIS.

The Central School of Arts and Manufactures was founded in 1829 as a private institution. It became a state institution in 1857.

The aims of the founders were to establish a school for the higher industrial studies, uniting the scientific theoretical branches with practical work. The plan originally adopted exists at the present day. The institution is intended to form engineers for all the various branches of industry and for the public service.

The minister of commerce, industry, and the colonies has direct control of this institution.

The course of study covers three years, as follows:

First year:	Lessons.
Analysis (differential and integral calculus)	33
Kinematics and rational mechanics	52
Descriptive geometry and applications	50
General physics	60
General chemistry	60
Mineralogy and geology	30
Construction of the elements and parts of machines	20
Architecture and civil constructions	30
Industrial hygiene and applied natural sciences	25
Total	360

Second year:	
Applied mechanics	60
Applied resistance	22
Construction and erection of machines	50
Industrial physics	44
Applications of electricity and of light	28
Steam engines	36
Analytical chemistry	48
Technological chemistry	40
Architecture and civil constructions	50
Legislation and industrial economics	25
Total	403

Third year:	Lessons.
Applied mechanics (hydraulics)	45
Construction and erection of machines	45
Industrial chemistry	50
General metallurgy and metallurgy of iron	55
Exploitation of mines	40
Public works	53
Railroads	40
Total	328

The first year's studies relate to the general sciences. They constitute a basis of the encyclopedic instruction of the engineer.

The second year's courses pertain more especially to technical instruction. They are taught by engineers who are in actual daily practice, and the pupils must adapt themselves to ideas which are more positive and less abstract. The studies are completed by laboratory exercises and visits to factories. In the middle of the second year students have to specialize into one of the four branches—machinists, constructors, metallurgists, or chemists.

The average number of pupils admitted each year is 250. Graduates find ready employment as engineers, managers of establishments, constructors, etc.

During the last half century more than 4,000 graduates of the school have been distributed over all parts of the globe. About 600 foreign pupils have graduated, most of whom are now occupying high positions in their respective countries. Many of the buildings of the late exposition, the Eiffel tower, the palace of the Trocadéro, and part of the machinery hall are works of former pupils of this school.

Candidates for admission must be at least 18 years of age and must pass an examination.

A sum of 60,000 francs ($11,580) annually is set aside by the government for assisting worthy young men with limited resources.

NATIONAL CONSERVATORY OF ARTS AND TRADES, PARIS.

The National Conservatory of Arts and Trades, which ranks as one of the great scientific institutions of France, was founded by the national convention in 1794, but was not organized until 1796. The celebrated museum was definitely installed in 1798.

The original object was to establish a collection of machinery, patterns, models, tools, drawings, descriptions, and books relating to all the branches of the arts and trades, and also of the originals of all instruments and machines invented or perfected; and to provide means for the explanation of the tools and useful machinery to those interested in the arts and trades. By a special ordinance of the government gratuitous courses of instruction on the application of the sciences and industrial arts were begun in 1819. The conservatory is to industrial

science what the College of France is to pure science. It has rendered great service in the application of science to industry and in the popularization of industrial questions.

There are fifteen professorial chairs, of which twelve are devoted to science applied to the arts and three to the general laws and results of labor, constituting, as it were, the philosophy of the subject. These fifteen courses vary in subject matter from year to year, as each course runs a number of years. The following are the subjects treated:

Mechanical arts—geometry applied to the arts, mechanics applied to the arts, spinning and weaving; art of construction—descriptive geometry, civil constructions; physics—as applied to the arts; chemistry—general chemistry, industrial chemistry, chemistry applied to the industries of dyeing, ceramics, and glass making; agriculture—agricultural chemistry, agricultural works and rural engineering; economic sciences and legislation—political economy and industrial legislation, industrial economics and statistics, commercial law.

As the instruction is addressed to an audience which is occupied during the day in commerce or industry, the courses are given in the evening between the hours of 7.45 and 10 o'clock. They continue from November to April of each year.

The lectures are public and gratuitous. In each course places are reserved in the amphitheatre for a certain number of pupils who have made application for the same to the professor. These constitute a class of regular auditors known by name to the teacher. From among these the prize men are selected.

The number of auditors varies from 120,000 to 130,000 per year. The number of regular auditors for which places are reserved is about 20,000.

The minister of commerce, industry, and the colonies has direct control of this institution.

The annual budget of the conservatory is about 290,000 francs ($55,970) for salaries, administration, and prizes, and about 152,000 francs ($29,336) for materials and sundry expenses, making a total of about 442,000 francs ($85,306).

INDUSTRIAL ART EDUCATION.

France possesses, in addition to the schools of fine arts, a number of institutions giving instruction in art as related to industry. The following are the principal schools of this kind:

NATIONAL SCHOOL OF DECORATIVE ARTS, PARIS.

This school was created especially to educate artists and artisans for industries in which art plays an important part. It has, therefore, both morning and evening classes. The instruction is given in two divisions, as follows: *Elementary* division—mathematics, geometrical

drawing, designing of ornaments, drawing figures and animals, sculpture; advanced division—architecture and construction, architectural drawing, legislation concerning buildings, *rilievo* designs, antique, living models and large *rilievo* ornamentation, sculpture, anatomy, history and composition of ornamentation, general history and history of industries.

Students must be at least 10 years old for the morning classes, and 14 years for the evening classes. Instruction is gratuitous.

NATIONAL SCHOOL OF DESIGN FOR GIRLS, PARIS.

This school is intended to provide the same instruction for girls as that provided for boys by the National School of Decorative Arts. The teaching is done in three divisions, the elementary section, the advanced section, and a special course, as follows: Elementary section—free-hand drawing, perspective, plans, ornaments, designs from *rilievo* heads, flowers, etc.; advanced section—designs of ornaments, architecture alternating with the composition of ornaments or industrial models, designs of figures after the antique or nature, designs from natural flowers, history of art and comparative anatomy; the special course relates to modelling, oil and water color painting, painting on porcelain and Delft ware, engraving on wood, and etching.

Tuition is free. Candidates for admission must be at least 12 years of age.

Schools on the model of the National School of Decorative Arts at Paris have been created in several departments, for both sexes. The instruction is gratuitous. Candidates must know how to read, write, and perform simple mathematical calculations.

SCHOOL OF TAPESTRY, AUBUSSON.

The instruction at this school relates more especially to the manufacture of tapestry. It comprises geometrical drawing, ornamental designing, the elements of architecture, anatomy, and decorative composition; special courses relating to local industries, tapestry designing, preparation of cards for weaving, embroidery, and chemical coloring.

Boys must be at least 13, and girls 12 years of age, to be admitted.

SCHOOL OF CERAMICS, LIMOGES.

The instruction relates especially to the manufacture of ceramics. There are three divisions—the elementary, superior, and special. The elementary division comprises free-hand drawing; ornamental designing; geometrical drawing (perspective, shading, and coloring); *rilievo* (ornament, flower, figure). The superior division includes drawing from the antique, nature, and living models; comparative anatomy; *drawing* from large *rilievo* and models taken from art industries

(bronze vases, ceramics, furniture, tapestry, etc.); architecture; composition of ornament; general history. The special course includes modelling; drawing and painting of flowers from nature; ceramic painting; engraving for ceramic impressions.

Boys must be 13, and girls 12 years of age, to be admitted.

SCHOOL AT NICE.

The instruction consists of geometrical drawing and drawing of ornaments after the antique and from nature; sculpture after the antique and from nature, with exercises in composition; elementary mathematics and perspective; elements of architecture; architecture (course in construction); history and composition of ornament; comparative anatomy; applications to decoration.

Pupils must be at least 10 years of age to attend the day classes, and 14 for the night classes.

NATIONAL SCHOOL OF INDUSTRIAL ARTS, ROUBAIX.

This school, which was organized at the expense of the state and the city of Roubaix, has for its object the education of artists and artisans for the industries of Roubaix.

The instruction comprises twenty-two courses of study, as follows:

Section of design and painting: Preparatory free-hand drawing; elementary drawing and the perspective of observation; intermediate drawing (ornament, head); advanced drawing and artistic anatomy; history of art; painting; decorative composition.

Section of architecture: Linear and plain geometrical drawing; algebra and geometry in space; applied mechanics and descriptive geometry; sketches of machines; architecture; general construction, for workmen on buildings.

Industrial section: Chemistry; physics; dyeing, first year; dyeing, second year; experiments; weaving, first year; weaving, second year; practical work in threading; heating.

This school possesses large physical and chemical laboratories. The laboratory for dyeing permits fifty students to work at the same time, and to perform experimentally all the operations required in dyeing.

The average attendance is 600 pupils. The annual budget is 70,000 francs ($13,510).

SCHOOL OF INDUSTRIAL ARTS, SAINT-ETIENNE.

This school was organized on the model of that of Roubaix. The instruction includes nineteen courses: Three in drawing; eight special courses—elementary geometry, descriptive geometry, perspective, anatomy, history of art, physics, chemistry, geometrical drawing; eight

courses of application—decorative composition, modelling, architecture, engraving of arms, preparation of cards for weaving, weaving, dyeing, heat and mechanics.

The average attendance is 450 pupils.

SCHOOL OF INDUSTRIAL ARTS, REIMS.

This school was created for the education of artisans for different industries. It is a day school. Evening classes are also held.

The day classes are for pupils who specialize in a certain branch of industrial art, and the evening classes are for artisans, laborers, and employés who desire to perfect themselves in their work. The instruction comprises an elementary division, an advanced division, and special courses, as follows:

The elementary division: Geometrical and free-hand drawing; perspective and shadows; elements of drawing from *rilievo* and from figures. The advanced division: Drawing of figures from nature and the antique; comparative anatomy; drawing of ornaments from models borrowed from art establishments, tapestry, furniture, bronzes, vases, etc.; elementary study of architecture; drawing of machinery; composition of ornament; general history of art. The special courses comprise: Modelling; wood and stone sculpturing; oil and water color painting; architecture; construction of buildings; carpentry; stone cutting; iron work; verification of works; preparation of cards for loom work. Twice a week the classes are open to girls, who must be accompanied by a parent or guardian.

The attendance in 1889–'90 was 350 pupils. Pupils are required to be at least 13 years of age. They must be able to read and write and understand the elements of arithmetic. They are classed according to special aptitude, as determined by examination.

MUNICIPAL DRAWING SCHOOLS.

There exist, also, numerous municipal drawing schools in France, most of which are subsidized by the state. Although the state exercises, to some extent, a control over the instruction, the latter is far from uniform. The programmes vary according to the particular needs of the locality or the existence of local industries.

The instruction is divided into three classes, which generally include the following subjects:

Elementary classes: Free-hand and linear drawing. Intermediate classes: Drawing of ornaments and parts of *rilievo*, the practical study of projection (sketches, plans, levelling, etc.). Advanced classes: Drawing from *rilievo*, general history of art, study of order and ordinances, the application of projection to carpentry, iron work, stone cutting, etc.

About 250 schools of this kind exist in France.

DRAWING IN PUBLIC SCHOOLS, PARIS.

Instruction in drawing is commenced in the infant classes, where it precedes that of writing; it is continued in the elementary primary schools, and carried to a still further extent in the advanced primary schools. As the latter are available for only a few, the city of Paris has provided for evening classes in a number of the communal (public) schools, where gratuitous instruction is given in drawing and modelling to apprentices and adults. This instruction consists of: Geometrical drawing, with its practical applications—draughting machinery, architectural drawing, coloring, etc.; free-hand drawing (ornament and figure) executed after relief; round *rilievo*, plants and living models, modelling, and sculpture.

These courses are open every evening from 8 to 10 o'clock. There are 70 of these schools for men and 17 for girls and women.

The instruction given in the above mentioned schools is mainly of a general and theoretical character.

The city of Paris, desiring to complete the education thus given by instruction relating more particularly to industry, created in 1883 two schools of design, one of preparatory practical designing, and the other for the application of the art to a certain number of industries. The latter is a complement of the former.

GERMAIN PILON SCHOOL, PARIS.

This is a municipal school preparatory to practising designing. The instruction, which is entirely gratuitous, lasts three years, and includes: Applied mathematics, drawing from relief work, round *rilievo*, plants and living models, sculpture and decorative painting, architectural designing and history of art, history and composition of ornamentation. There are two courses, one during the day and the other in the evening from 8 to 10 o'clock.

Candidates for admission to the day classes must be 14 and those for the night classes 15 years of age. Candidates provided with certificates of primary education may enter at 13 years of age.

BERNARD PALISSY SCHOOL, PARIS.

This is a municipal school for the application of the fine arts to industry.

There are four shops for practical work, viz., one for ceramics, glass-work, and enamelling; one for decorative painting; one for sculpture in wood, marble, ivory, and metals; and one for designing for cloths and furnishings. These branches relate to the industries which predominate in the quarter where the school is located.

The course is for three years. The instruction is gratuitous. There

are both night and day schools. Candidates must be at least 14 years old for the day school and 15 years old for the night school. They are examined for admission. The annual budget amounts to about 62,000 francs ($11,966).

TRAVELLING SCHOLARSHIPS TO GRADUATES OF INDUSTRIAL SCHOOLS.

The minister of commerce and industry gives every year a number of travelling scholarships to graduates of industrial or trade schools.

The value of these scholarships varies according to the importance and duration of the trip from 1,500 to 3,000 francs ($289.50 to $579) a year. They are renewable once or twice, but not longer. Holders of scholarships may choose the country wherein they temporarily sojourn. They must study industrial matters while abroad and send a report of their studies and observations at least every three months to the minister of commerce and industry.

Scholarships are awarded after competitive examination, comprising a translation, a composition, and a technical industrial report in either English or German, at the choice of the candidates.

Candidates must furthermore be of French nationality, between 21 and 30 years of age, have graduated from a public school either wholly or partially under the control of the minister of commerce and industry, and have produced also certificates of health and good morals.

CHAPTER V.

PRESENT STATUS OF INDUSTRIAL EDUCATION IN GERMANY.

CHAPTER V.

PRESENT STATUS OF INDUSTRIAL EDUCATION IN GERMANY.

MANUAL TRAINING.

The author of the Leipsic treatise on Education for Labor expresses the opinion that it is a reproach to Germany, the land of schools, that she has permitted France, Austria, Sweden, and Switzerland to anticipate her in the establishment and extension of a system of manual training in the schools.

He claims that, ever since Martin Luther's day, the leading German educators have strongly urged the necessity of introducing hand training into the schools as a means of mental discipline. Yet he declares that the ideas of such men have been spurned as dreams and phantasms, well enough in the realm of thought, but incapable of growth in the solid ground of reality.

According to Herr Endris the first instruction in manual training given on German soil was begun by Clauson-Kaas, a Dane, at Emden, in the province of Hanover, on the 6th day of September 1880. This foreign enthusiast organized a course of training for teachers, of whom there were 63 in the first class formed The subjects of instruction included carpentry, basket making, straw work, bookbinding, etc.

From this small beginning came a demand for similar instruction elsewhere, resulting in the formation of associations at Leipsic and Dresden for the promotion of the new enterprise. In Saxony the movement excited great enthusiasm. To reduce the expense of the experiment the minister of internal affairs granted a subvention of 3,000 marks ($714), and the minister of education declared his willingness to aid the cause by every means in his power. At Dresden, where Clauson-Kaas gave a course of instruction, a class of 66 members was formed, composed of as many distinguished men as were ever placed under one teacher together, except possibly in Dr. Holmes's class at Harvard. There were Böttcher, Kockel, Birch-Hirschfeld, and many more whose rightful titles can confer no additional honor on their names. These men submitted themselves to the unwonted discipline of hand work daily, from 7 o'clock in the morning until nightfall, during the entire course. The subjects taught were the same as at Emden, with the addition of metal work and modelling in plaster.

The interest was great. The king, ministerial officers, and deputations from various societies, besides many other high personages, hon-

ored the occasion by their presence. Minister von Gerber declared that hereafter no *Turnhalle* should be conducted without the adjunct of a school workshop.

In northern Germany there are now many institutes of manual training. School workshops have now been established at Emden, and at Königsberg, Kiel, Bremen, Leipsic, Dresden, Pforzheim, Stuttgart, Carlsruhe, etc., and recently manual training has been introduced into the Teachers' Seminary at Dresden, and placed under the direction of Clauson-Kaas.

This indefatigable worker organized a women's class at his home in Dresden in the month of July 1887, in order to prepare mothers for training their boys to some form of manual dexterity. By this means he sought to help those families whose boys could not, or would not, attend the public manual training school.

On the 1st day of July 1887 Dr. Götze opened a manual training seminary at Leipsic. At the beginning of the course only 22 pupils were in attendance; but soon the experiments attracted so much attention that on the 18th of July nineteen teachers in Italy applied to the Italian ministry of instruction for permission to visit Leipsic for the purpose of learning the system of manual training.

The German people began at last to appreciate manual training, and to demand it as a part of school discipline. The unremitting agitation of the question by such exponents of education as Clauson-Kaas, Götze, Schenckendorff, and Biedermann has produced its legitimate effect.

Public opinion in Germany seems to favor the extension of manual training, which is now regarded as essential to a complete educational system.

Hugo Elm gives the names of thirty cities in Germany where, at the date of the publication of his work (1886), manual training schools had been established; yet he acknowledges that his data are incomplete, and that the number of such institutions has now doubled.

The German schools of this class, however, are not ideally perfect. Prof. J. M. Ordway of Tulane University relates that a few years ago he visited a number of *Gewerbeschulen*, expecting to find regular manual labor schools; but he found very little manual work done there. Prussia had a few trade schools, but these generally neglected the education of the man. In Sweden he found a far better system. The Swedes came nearest to his ideal and the ideas we are trying to work out.

At the eighth German manual training congress, Herr Schenckendorff, referring to the early progress and present condition of the labor school movement in Germany, said:

In the year 1851 Prof. Biedermann of Leipsic wrote a book on Education for Labor in which he treated the subject in a striking and original manner from the point of view then assumed by the promoters of the movement in Germany. If we examine this remarkable work

we shall discover that the ideas therein expressed are in harmony with ours of today.

The speaker restricted himself to a brief sketch, but referred to a forthcoming statistical publication on the subject (in course of preparation at that time by Herr Sonntag of Leipsic), to be submitted to the next congress.

Herr Schenckendorff expressed great admiration for the system of training devised by Mikkelsen of Denmark, and said that, in respect to thoroughness, it seemed to him the nearest to perfection of any. Next in order of preference he would place the system of Salomon, who limits his teaching to joinery.

The report alluded to in the address of Schenckendorff, as in preparation, is entitled, *Bericht über den Stand und die Ausbreitung des Arbeitsunterrichts in Deutschland.* It is exhaustive in detail, and was presented to the ninth German manual training congress by its author, Herr Sonntag of Leipsic.

From this valuable report, and from an excellent abstract of it published in *Blätter für Knaben-Handarbeit*, January 1890, we summarize the following facts (it being borne in mind that the report aims to give an account of the historical development of manual training in Germany, wherever it has been introduced, from the year 1880 to 1888):

The number of school workshops in existence in Germany, and the number of places where they have been established, are the matters first recorded. Of independent school workshops there were 67 in 62 places; in teachers' seminaries, 12 in 12 places; in private and common schools, 12 in 12 places; in orphans' homes, 15 in 14 places; in boys' homes, 44 in 21 places; in reformatories, 10 in 10 places; in asylums for feeble-minded, 2 in 2 places; in blind asylums, 5 in 5 places; in deaf and dumb asylums, 7 in 7 places; in school workshops with industrial object, 12 in 12 places. A total of 136 school workshops in 120 places.

From the same publication is drawn a table showing the number of pupils and instructors in manual training in Germany prior to 1880, and for each subsequent year down to 1888:

PUPILS AND INSTRUCTORS IN MANUAL TRAINING IN GERMANY.

Year.	Pupils.			Teachers.	Artisan-teachers.
	Total.	*Volks-schulen.*	Higher schools.		
Prior to 1880	113	66	47	1	9
1880	304	216	88	6	15
1881	548	392	156	16	25
1882	986	756	230	27	27
1883	1,750	1,351	399	40	32
1884	2,080	1,720	360	55	35
1885	2,256	1,879	377	65	36
1886	2,774	2,279	495	101	39
1887	3,839	2,887	952	160	42
1888	5,678	4,370	1,308	208	48

Concerning this table, it is observed that in the year 1888 the number of pupils was almost 19 times as large as in 1880, and the number of teachers 12 times as great as in 1880. The pupils of the higher schools are of the intermediate, the Latin, the real-schools, the pro-gymnasia, the seminaries, the real-gymnasia, and gymnasia.

In the same journal, February 1890, is to be found the concluding portion of this abstract. The first table there given relates to the specific kinds of manual training in vogue in the different school workshops, as follows:

KINDS OF MANUAL TRAINING AND NUMBER OF SCHOOL WORKSHOPS.

Year.	Pasteboard work.	Wood carving.	Joinery.	Metal work.	Modelling.
Prior to 1880	5	1	2	.....	.....
1880	9	2	6	2	1
1881	13	8	13	2	2
1882	17	10	17	3	4
1883	24	15	23	2	4
1884	29	21	35	2	3
1885	36	23	38	4	3
1886	45	34	41	5	4
1887	62	47	52	6	4
1888	77	61	60	7	3

In 1888, therefore, pasteboard work was carried on in about 80 per cent. of the school workshops; wood carving, in about 63 per cent.; joinery, in about 60 per cent.; metal work, in about 7 per cent.; and modelling, in about 3 per cent.

The following table indicates the number of pupils receiving instruction in the various special forms of manual training during the same years:

KINDS OF MANUAL TRAINING AND NUMBER OF PUPILS.

Year.	Pasteboard work.	Wood carving.	Joinery.	Metal work.	Modelling.
Prior to 1880	67	6	10	.....	.....
1880	117	13	49	24	17
1881	203	81	194	20	27
1882	424	103	400	84	256
1883	553	202	713	50	166
1884	752	307	901	24	72
1885	973	446	945	41	56
1886	1,103	713	1,076	61	49
1887	1,600	1,116	1,497	57	32
1888	2,400	1,797	1,785	70	40

Accordingly, in the year 1888, about 43 per cent. of the whole number of pupils were pasteboard workers; about 32 per cent., wood carvers; about 31 per cent., joiners; about 1.2 per cent., metal workers; about 0.7 per cent., modellers.

The school workshops are sometimes located in rented rooms; sometimes (and for the most part) in rent free school rooms. Occasionally, in building a new *Turnhalle*, a specially fitted-up room is set apart for a pupils' workshop in connection with it.

The question: Should artisans or teachers give the instruction? is in the way of a practical solution. The percentages of instructors are as follows:

PERCENTAGES OF TEACHERS AND ARTISANS.

Year.	Percentage of—	
	Teachers.	Artisans.
Prior to 1880	10	90
1880	29	71
1881	39	61
1882	50	50
1883	56	44
1884	61	39
1885	64	36
1886	72	28
1887	79	21
1888	81	19

The number of teachers that instruct pupils in manual work has increased from 10 per cent. prior to 1880 to 81 per cent. in the year 1888; while the number of artisans that teach pupils has suffered a consequent diminution. In the school workshops instituted with an educational purpose teachers, with few exceptions, are the instructors. In several institutions where artisans are still retained as manual training teachers, it is openly declared that a technically educated pedagogue is to be preferred.

The principal specialties of instruction are pasteboard work, wood carving, joinery, and, to some extent, metal work and modelling. These are the five regularly instituted forms of discipline of manual training at present, though various other branches of instruction have been adopted in educational establishments that have to do with special conditions. Of these gardening is given a special preference in many places.

Generally each pupil is instructed for two consecutive hours; though in some cases the duration of the teaching varies from one and one-half to three hours. In this connection it should be remarked that everywhere in Germany manual instruction is given every day of the week, including Sunday.

The number of pupils in one department varies with the several specialties. In pasteboard work it runs from 12 to 20; in wood carving, from 10 to 24; in joinery, from 12 to 16.

Where the so-called preparatory courses exist children are received at from 5 to 6 years of age. For pasteboard work they must be at least 9 years old; for wood carving, at least 11; and for joinery, only 12 year old boys are admitted as a rule.

At Wertheim, Baden, in September 1888, was founded *die Schülerwerkstatt* of the city, by the school superintendent of the grand duchy. The specialty of this school is pasteboard work. In 1889 there were 53 pupils and 1 teacher. The ages of the pupils ranged from 9 to 18.

Up to February 1889 the tuition for each pupil was 1.50 marks (36 cents). Since that time it has been reduced to 80 pfennigs (19 cents).

In the free city of Bremerhaven a pupils' workshop (*Schülerwerkstatt*) was founded in October 1888, by Herr Reuber. The city furnishes the school building, light, and heat, and also gives something for tool equipment.

Pasteboard work and wood carving are the specialties taught. In 1888 there were 32 pupils—17 taking pasteboard work, 15 wood carving. The pupils are from 12 to 14 years of age. Thirty-one of these pupils attended the *Volksschule*, and one a higher grade. Each pupil pays 5 marks ($1.19) for instruction and material. In 1881 manual training was introduced into the ragged school (*Armenschule*) at Lubeck. In 1886, after this school had been abolished, the training (*Handfertigkeitsunterrickt*) was pursued in a special shop. Carpentry, brush making, slipper making, spoon carving, fret sawing, wood carving, and straw braiding are the practical exercises. Two hours a week are devoted to instruction. In 1888 there were 75 boys under instruction. Pupils may keep their work without charge. Tuition is free.

At Halle, Saxony, on the 8th of January 1887, a manual training school was established by Dr. Schrader, director of the real-gymnasium.

The classes occupy five rooms in the old *Bürgerschule, Poststrasse.* Dr. Schrader is director, but a committee under his supervision manages the school. A skilled workman is chosen to give instruction in each of the technical subjects pursued. Pasteboard work, carpentry, wood carving, and (when called for) turning are taught.

In 1889 (first quarter) there were 158 pupils—40 taking pasteboard work, 52 cabinet work, 66 wood carving. By the school statute boys who attend a public school can take only one manual training specialty.

In 1888 Dr. Schrader opened a teachers' course in carpentry and wood carving. Two Vienna teachers say, "The Halle shops are among the best conducted that we have seen."

In 1887 a manual training school shop (*Schüler-Handfertigkeits-Unterrichts-Anstalt*) was established at Glogau by the industrial society of that city. The Silesian Central Trade Union contributed 300 marks ($71.40) toward the equipment of the shop; but the establishment's current expenses are met by voluntary contributions. Nothing has been received as yet from the public (municipal) treasury. Two hundred and forty marks ($57.12) would be necessary to pay for rent of a suitable building; but such expenditure is beyond the means at the disposal of the committee. For this reason they are compelled to postpone the establishment of a much desired course in joinery.

Herr Eckert is the director, and he is assisted by two manual training teachers. Pasteboard work and wood carving are the branches taught, the latter having been begun October 19, 1887. The course of instruction runs throughout the school year.

In 1887 there were 32 pupils in this shop, with two teachers; in 1888 25 pupils attended the course. The pupils come from the *Volksschule*, and range in age from 12 to 14 years. No tuition fee is charged; though a small amount (about 50 pfennigs—12 cents) per quarter is required of middle school pupils to defray the cost of materials. The income (from this source) is scarcely worth mentioning, however.

The director is paid 180 marks ($42.84) annually; the two teachers 120 marks ($28.56).

The pupils like to attend the course of instruction in this shop; and the results are good, or, at least, encouraging, is the final comment of the reporter.

The Manual Training School at Görlitz was established May 3, 1881, by Herr Schenckendorff. Since the second year of its existence this school has been under the patronage of her royal highness, the crown princess, now the Empress Friedrich. The school is supported by the Society for the Promotion of Manual Training and Youthful Games. The expenses for 1887 were 2,467.23 marks ($587.20). The director is assisted in the instruction by five teachers.

The school serves an educational purpose exclusively; it is not designed to promote any industrial end. The teaching in every specialty is conducted on pedagogical principles. Herren Neumann, Dr. Schneider of Leipsic, Gelbe, Salomon, and Müller are among the lecturers.

From the beginning pasteboard work and wood carving have been taught in the Görlitz school. From 1881 to 1884 modelling was one of the branches of instruction; but in 1884 this branch was set aside on account of the objections urged against it by Director Grunow of Berlin, and carpentry was substituted the same year.

The course extends through the school year. Each boy receives four hours' instruction a week. The ages of the pupils range from 12 to 14 years. Pupils come from gymnasia, real-gymnasia, burgher, private, and communal schools. The articles made remain the property of the pupils, only a few being retained for exhibition or other purposes. Pupils of the higher institutes pay a monthly tuition fee of 1 mark (24 cents), as do extra course pupils. Other pupils pay no tuition.

The director of the Görlitz Manual Training School receives a salary of 450 marks ($107.10) a year. Each teacher is paid 300 marks ($71.40) a year for teaching eight hours a week.

It was the case with this school at first that many difficulties and objections raised by the master workmen had to be overcome. The bookbinders' guild determined to receive no boy as an apprentice who had been a pupil of the manual training school. Now there is no reluctance to accept such pupils as apprentices. Master bookbinders and master joiners send their own children to the school, and, in some instances, permit them to pursue a more thorough course than apprentices take.

A teachers' course was instituted in March 1887 in conne this school.

On October 1, 1882, the *Bürgerschullehrer*, Friedr. Pötzschn established a manual training school at Markneukirchen. T is maintained by the state and the commune. A school ro vided by the commune with heat and lighting. Pedagogical govern the instruction. During the year 1885 there were s pasteboard work; but with this experiment it was given sawing has been carried on from the beginning; and to this wood carving in 1886. Four hours a week are occupied with The number of pupils has steadily increased from 6 in 18 1838. Tuition costs 2 marks (48 cents) a quarter.

The director and the class teachers are well satisfied wi struction in manual training. This is all the more gratifyin in the beginning (especially in 1882), the school had to co the ignorance of the citizens and the opposition of some te is chiefly by means of exhibitions that the cause of manu has so quickly achieved success.

Real-school director, Dr. Gelbe, opened a manual train (*Handfertigkeitsschule*) at Stolberg in 1885. Rooms for inst granted, rent free, in the building of the real-school. A wel joinery shop is established in the basement, while pasteboa taught in one of the class halls.

Pasteboard work and wood work are the manual exer course runs from May till February, and two years are requi plete the full work of either class. Real-school pupils, fro years of age, are permitted to work in the course for pastebo pupils, 14 to 16 years old, take the wood work course. T adopted in order that there may be a gradual advance. All required to wait until their fourteenth year before beginni so as to insure a sufficient physical development and amp for the work. Besides, the pasteboard work constitutes a preparation for joinery.

In 1888 the number of pupils was 48; the number of teach tuition fees in the pasteboard work course are 1.50 marks (3 the lower division, and 2 marks (48 cents) in the higher. T the joinery course is 3 marks (71 cents).

A small class of teachers has been organized and conduc nection with this school for several years.

In 1881 a manual training school was established at Dres *Gemeinnütziger Verein.* This society pays out of its treasury between 1,600 and 1,900 marks ($380.80 to $452.20) for the the school. The minister of education grants some aid tuition fees supply the remainder of the income. Six hund ($142.80) are paid for rent of the room at 23 Canal stree the school; while three workshops, located in different se

ings, are at the service of the school, rent free. On account of the size of Dresden shops are needed in all quarters of the city.

The branches taught are paper work (in the preparatory grade), pasteboard work, carpentry, and wood carving. The school is in session from ten to ten and one-half months in the year.

In 1881 there were 89 pupils in this school, taught by 4 teachers and 1 artisan. In 1888, 305 pupils were in attendance, and there were 12 teachers and 2 artisans giving instruction.

In the preparatory department the ages of pupils range from 6 to 8 years; in the pasteboard work grade, 8 to 14; in joinery, 8 to 17. Pupils belong to district schools, burgher, private, and society schools, to real-gymnasia and gymnasia.

The articles made by pupils remain in the custody of the school until after the exhibition. Tuition costs 2 marks (48 cents) a month. Ninety half-rate scholarships exist, however. The manual training teacher receives 3 marks (71 cents) for every two hours' service, if he belongs to the rank of teacher; 1.70 marks (40 cents), if to the artisan class.

A teachers' course was opened by the society in 1880 with 4 teachers under instruction. In 1888 there were 42 taking the course.

Twice a year the former pupils meet for the discussion of manual training questions. Most of the managers of the five children's homes in Dresden have learned something of manual training, and through them instruction in this branch has been introduced into the homes over which they preside.

At first (from 1880 to 1884) the course included only pasteboard work and carpentry. Since 1885 wood carving has been added.

Most of the teachers in the people's schools (*Volksschulen*) take the course; some of the teachers of higher schools and, since 1883, laymen (*Nichtlehrer*), too, have joined the classes. In 1888 there were ten of these belonging to the most diverse stations in life. The eldest is an apothecary 72 years old.

In the summer of 1882 the society, in conjunction with the Leipsic association, instituted a course commonly called the summer course. The attendance was very large. In all there were 63; among the number, 54 teachers of the *Volksschulen*; 4 teachers from higher schools; and 5 non-professional pupils (*Nichtlehrer*). Pasteboard work, carpentry, wood carving, modelling, and metal work were the branches to which they devoted themselves.

The City Manual Training School at Weimar was founded in October 1885 by Burgomaster Pabst. The savings bank gave 1,500 marks ($357) for its equipment, and annually contributes to its support 1,000 marks ($238). At first a room in the garden-work school served as a shop. In 1888, however, the school committee secured two fine rooms in a burgher school free of cost.

The plan of instruction excludes special industrial training, and aims only at educational ends—a habit of work, exercise of eye and hand,

and the formation of the taste and æsthetic judgment. The branches taught are pasteboard work, joinery, with wood carving, and metal work.

Every boy in this school receives two hours' instruction a week. In 1888 the school had 46 pupils. The ages range from 8 to 14 years. All the boys attend the *Volksschule*, and, at the same time, the City School of Garden-work. After a public exhibition at the end of the school year the articles made are sold, and from the proceeds premiums are purchased to be awarded, on the grand duke's birthday, to the most deserving and most diligent pupils. There are no tuition fees. The instructors are paid 1.50 marks (36 cents) an hour.

As one result of the training, it is observed that while formerly pupils on leaving the *Volksschule* commonly sought work as day laborers, they now, since the introduction of manual training, almost without exception, devote themselves to manual trades.

The introduction of carpentry into Falk Institute was brought about by a visit of several governmental officers to the Weimar school. Recognizing the great educational value of what they saw in this manual training school, they took measures to extend the benefits of such instruction to other establishments under their control.

A private course for pupils of higher institutions was held during the winter of 1888–'89 at Weimar. This course—in which pasteboard work, carpentry, and wood carving were taught—was attended by about 20 pupils of the gymnasium and real-gymnasium. Fifty-two boys, from 10 to 14 years old, were instructed for six hours a week during 1891 in four branches taught here.

At Pforzheim, grand duchy of Baden, a manual training school was founded by the City Aid Society (*Städtischer Hilfsverein*) and derives its support from that association. The head teachers, Herren Wörner and Weber, were educated for their work at the expense of the society, the first at Berlin, the second at Emden. The training consists of the following branches: Wood carving, pasteboard work, scroll sawing, brush making, and basket weaving. In 1888 there were 125 pupils. Pupils' ages vary from 11 to 14 years. All the boys attend the *Volksschulen*. Tuition is free.

At Munich a pupils' workshop was opened in October 1887 by the People's Education Society (*Volksbildungsverein*) from which it derives its support. There are three instructors—one in pasteboard work, one in carving, and one in joinery. Pupils work at these specialties from 2 to 4 o'clock on Wednesdays and Saturdays, making four hours a week. In the school year 1888–'89 there were 71 pupils in attendance. From the age of 10 to 12 they are taught pasteboard work; from 11 to 14, wood carving and carpentry. Pupils are permitted to keep articles made by them, except that articles of special excellence are reserved for a collection of specimens to be set up in the shop. Tuition costs 3 marks (71 cents) a month. For every hour of teaching per week teachers receive 72 marks ($17.14) per annum.

The Leipsic pupils' shops were founded by the Mutual Benefit Association. Herr Lammers and Dr. Götze were instrumental in securing their establishment. April 7, 1880, a teachers' course was opened; and, in the same year, the pupils' course began. There are at present 7 rooms occupied as workshops, in the old Thomas school. Dr. W. Götze is director. The teachers (including artisans who are instructors) are 23 in number.

The matters taught are pasteboard work, carpentry, wood carving, metal work, and modelling. The instruction is timed so as to accommodate as many as possible—each class taking a two-hours' lesson on Wednesday and Saturday afternoons, from 2 to 4, 3 to 5, or 5 to 7 o'clock. Pupils are received twice in the year, entering at Easter and at Michaelmas. During the summer of 1889 there were 297 pupils. But in winter the attendance is larger; as, in the winter of 1888–'89, there were 386 pupils. They range in age from 8 to 16, belonging to various grades—*Volksschulen*, private schools, and higher institutions. Teachers' fees are 3 marks (71 cents) for every two hours' teaching. A teachers' course has been conducted in connection with this establishment ever since its foundation in 1880.

At Grimma something has been attempted for a long time in the way of manual training at the Royal Teachers' Seminary, and at the Royal Seminary for Candidates for the Teacher's Office. The introduction of pasteboard work, for example, dates back fifty years in these institutions.

Master Bookbinder Vorholz has taught pasteboard work since 1874, and Master Joiner Rohr has taught his specialty since October 1884. The instructors are cramped for room, however, and not until the seminaries obtain a new building will manual training be pursued with success.

A boys' work school was opened at Carlsruhe by the municipal authorities February 1, 1881. The branches taught are scroll sawing, folding exercises, wood carving, pasteboard work, bookbinding, and brush making. This last branch, however, has been dropped on account of the too great cost of materials, and because of its very questionable educational value. Instruction in carpentry could be introduced only to a very limited extent, since for a long time only one bench could be had.

The pupils are recruited from the gymnasium, real-gymnasium, real-school, burgher school, and a few from the boys' school. Tuition costs 12 marks ($2.86) a year. Besides this pupils must repay the city treasury the cost of the raw materials used.

Until late in the year 1890 these were the only subjects taught. Then Herr Reinfurth undertook the teaching of carpentry and pasteboard work; Herr Galm, carpentry and metal work; and wood carving and pasteboard work fell to Herr R. Jais.

There are only two divisions for carpentry, with 5 pupils in each,

because the shop is supplied with barely enough tools for this number in that specialty; two, also, for pasteboard work, with 14 and 16 pupils, respectively; one division for wood carving, with 22 pupils; and one for metal work, with 14 pupils. Each division receives two hours' instruction a week.

Since Easter, 1891, no tuition fee has been charged, and materials are furnished to pupils free of cost.

A manual work school for boys was opened at Brieg in October 1889. The school year of 1891–'92 began April 15, 1891. Thirteen of the pupils were from the gymnasium, 1 from the school of agriculture, 17 from the burgher school, and 2 from the *Volksschule*—33 in all.

To the instruction in pasteboard work was added that of carpentry at the commencement of the school year. Every pupil receives two hours' instruction once a week; in summer from 2 to 4 o'clock on Wednesday and Saturday afternoons, and in winter from 5 to 7 o'clock on the same days. Tuition costs 7.50 marks ($1.79) for the half-year, to be paid in advance at the rate of 3.75 marks (89 cents) a quarter.

The system of manual training pursued in the German real-schools may be indicated by a description of the Royal Real-school at Augsburg. From the annual report for the school year 1890–'91 it appears that the teaching staff of this institution consists of 24 teachers. The course of study is essentially the same in all German schools of this class; that is to say, the real-school is a high school without classical studies.

The manual exercises in this school consist of free-hand and linear drawing and turning. Three hours per week are given to drawing and two hours to exercises in turning.

Besides these exercises two hours a week are devoted to religious instruction (Catholic, Protestant, and Jewish); six hours each to German and French; two hours to geography; five to arithmetic; three to writing German and English script; and one hour to singing—in all thirty hours per week. Later in the course history, algebra, geometry, physics, chemistry, mineralogy, stenography, etc., receive a share of attention, and five hours a week are set apart for the study of English literature and three hours each for French and German.

At the opening of the school year the whole number of pupils in this school was 501.

The prospectus of the so-called Trade School at Bremen (*Handelsschule* (*Realgymnasium*) *zu Bremen*) clearly demonstrates that, in spite of its name, this school should fall into the category of manual training institutions. Dr. Eduard Laubert is the director, and the names of 26 teachers appear on the roll of the faculty, though it is stated that the teaching force was reduced to 24 during the school year 1890–'91.

At the Easter season 1891 there were 351 pupils in the different classes of this establishment. The studies in detail are religion, German, Latin, French, English, Spanish, history, geography, arithmetic, mathematics, physics, chemistry, natural history, drawing, writing, singing, and turning. This last exercise entitles the school to be called

(by mere courtesy, however) a manual training school; it is not a trade school, as that term is generally understood.

There are three subdivisions of this school, viz., the continuation department, the department of industrial drawing, and the drawing school for boys.

In the continuation school are taught writing, arithmetic, German, bookkeeping, and physics. Fifteen teachers give instruction in this department. In the summer of 1890 there were in the Sunday classes of this department 332 pupils; in the evening classes 177.

In the department of industrial drawing special classes for drawing and modelling are held. Ten teachers do the work of this department. During the summer of 1890 there were in the Sunday classes 210 pupils; in the winter of 1890–'91, Sunday classes 277; painting class 22; evening classes 364.

In the boys' drawing school there were 245 pupils in the summer of 1890; in the winter of 1890–'91, there were 277 taught by 5 instructors.

At Mentz, in the year 1879, there was opened a public drawing class, and in October 1883 this establishment was broadened and converted into a school of industrial art (*Kunst-Gewerbe-Schule*). It appears that the work of this school has been constantly extending, and that there are now four divisions. The first division consists of an under, a preparatory, and an intermediate course. The second division contains four *Fach* schools, viz., a school of architecture, a school for manufacturers of small wares, a school of lithography and decorative painting, and a modelling school. The third division is an evening school, and the fourth consists of a course of instruction for women.

From the latest annual report, for the year ending March 31, 1891, we learn that in the half-year sub-class the following special studies are pursued, viz., geometrical and free-hand drawing, modelling, arithmetic, German, and ornamentation. Drawing enters largely into all the courses of instruction. In the evening school (from 7.30 to 9.30 every evening) free-hand, figure, and geometrical drawing are taught, with geometry, shading, architecture, perspective, industrial drawing (newly introduced), and modelling.

In the women's course landscape drawing with pen, pencil, and charcoal, together with flower, still-life, and ornamental drawing, painting in oil and water colors, etc., are the subjects taken up.

The teaching staff in the Industrial Art School consists of 7 teachers. The number of pupils in this school for the half-year 1890–'91 was 148, of whom 26 were women.

In the Artisans' School, also under control of the Mentz Industrial Society (*Gewerbverein*), there are 12 teachers, and the total number of pupils under instruction in this department during the year ending March 31, 1891, was 677, of whom 150 were joiners, 129 masons, 95 locksmiths, etc.

In the seven elementary schools of the Mülhausen Industrial Society there were in the school year 1890–'91, 89 male teachers and 87 female teachers. In the boys' department there were on April 1, 1891, 3,557 pupils; in the girls' department, 3,571; in all, 7,128.

The course of study includes the following subjects: Religion, German, French, arithmetic, geography, history, natural history, geology, drawing, writing, singing, turning, and domestic economy, including housework and other manual employments of women.

In 1880 a manual training school for boys was opened under the auspices of this society. Tuition is free, and expenses are paid out of the city treasury. The expense account includes the salaries of 4 teachers for eight hours per week, 2,400 marks ($571.20); work-master's salary, 400 marks ($95.20); materials, and incidentals 1,000 marks ($238); a total of 3,800 marks ($904.40).

For the purposes of manual instruction the Mülhausen pupils are classed in two divisions and taught in five workshops, after school hours, in lessons of two hours' duration each, on four days of the week. Only pupils of the common school (*Volksschule*) over 10 years of age are eligible as members. The teaching continues throughout the year, with the exception of school holidays. The manual exercises consist of carpentry, wood carving, clay modelling, iron work, etc.

In the girls' department of the manual training school at Mülhausen the necessary materials and equipments are supplied by the city. At the end of the year the articles made by the pupils are sent to the office of the burgomaster, and distributed in the charitable institutions of the city and to poor children.

In the course of the year 1890–'91 a great number and variety of useful articles were made by the girls of this school, among them 1,270 pairs of hose, 2,412 pocket handkerchiefs, 853 shirts, and jackets, blouses, curtains, etc., to the value of 4,754.30 marks ($1,131.52).

The Mülhausen Boys' Manual Training School has four workshops. The first one is devoted to carpentry, and is fitted up for 16 pupil workers according to the Danish system, by which is probably meant the system of Clauson-Kaas. The second workshop is devoted to pasteboard work and wood carving. The third workshop is the iron working room, equipped with forge, 19 vises, etc. The fourth workshop is the clay modelling room, fitted up with tables, or, rather, adjustable shelves, at which the pupils work, sometimes standing, sometimes sitting.

Strictly speaking, the Crefeld Continuation School (*Fortbildungsschule*) does not belong to any class of schools to which this investigation relates. It is a school which makes no pretence of teaching a trade; nor, unless drawing be deemed a manual training exercise, does it impart manual instruction. It is of the same rank as American evening schools, and it merely supplements the education of apprentices and others by means of classes in which German, arithmetic, bookkeeping, and drawing are taught. The plan of study in this continuation school constitutes a three years' course.

One of the many instances of the introduction of manual exercises into the public schools of Germany is to be found at Strasburg, where in August 1882 a course of modelling was introduced into the common schools (*Volksschulen*) of that city. In November of the same year a course in wood carving was added in the *Schülerwerkstatt.*

There are now seven distinct courses of instruction in manual training in vogue in the boys' schools of Strasburg, attended by nearly 300 pupils.

The course in modelling was opened in 1882. A second department was opened in June 1884, and a third in October 1885. There are now 60 pupils in this course.

Wood carving was begun in November 1882, with an attendance of 10 pupils. A second department was opened in May 1884, and a third in 1888. There are now 84 pupils.

In May 1883 a course in clay modelling was instituted; and in April 1884 the second and third departments of this course were opened. At present 45 pupils are taking this course.

The locksmiths' course was opened in June 1885. It has 48 pupils in attendance.

A fifth department (of artistic iron work) was begun in January 1889. There are 10 pupils in attendance in this course.

The sixth course is that of joinery, opened in December 1888. It has an attendance of 30 pupils.

In March 1890 the course in turning was opened. There are 6 pupils in attendance.

The tuition is free. The instructors are craftsmen (*Fachleute*), who work under the direction of the teachers of the city elementary schools.

The fourth annual report of the Berlin Central Society of Manual Labor for Boys—from April 1, 1890, to the end of March 1891—states that the membership of this organization, which increased from 248 to 322 during the year 1889, was further augmented in 1890, reaching the number of 348.

The financial condition of the society also improved; the treasury balance December 31, 1890, being 2,340.25 marks ($556.98), against 887.96 marks ($211.33) at the end of the preceding year.

The Prussian ministry of education contributed to the society during the year 2,000 marks ($476) and the city of Berlin 1,800 marks ($428.40). The membership fees for the year aggregated 2,422.50 marks ($576.56); the tuition, 6,038.50 marks ($1,437.16), making a total income (including balance on hand at end of year 1889) of 13,148.96 marks ($3,129.45). The total expenses were 10,808.71 marks ($2,572.47), leaving balance as above, 2,340.25 marks ($556.98).

The object of the society is to establish and maintain workshops in connection with the schools, and accessible to the pupils of all Berlin schools.

Up to date of the report four workshops had been established. The

manual exercises in these shops include paper work, wood carving, and carpentry.

Attendance of pupils in the shops for the summer half-year, 1890, was 236; for the winter half-year, 1890–'91, 325.

The training is progressive, gradually advancing from paper work, for boys from 9 years old and upward, to wood carving for boys from 11 years old and upward, and carpentry for boys of 12 and over. The instruction is given on Wednesday and Saturday afternoons at 3 o'clock and each lesson occupies ninety minutes.

The fees, payable quarterly for the tuition, material, and use of tools amount to 5 marks ($1.19) in the paper and wood carving division, and to 6 marks ($1.43) in the carpentry division.

Special provision is made in the city of Berlin for the publication of an annual report on the condition of the continuation schools, and for its distribution among the guilds and industrial societies of the metropolis. The Eighth Annual Report, bearing the date of February 1891, is full of valuable information.

The number of pupils under instruction in the schools of this class in Berlin during the winter 1890–'91 is given as follows: Students of German, 3,718; arithmetic, 3,580; drawing, 4,808; special drawing, 2,018; bookkeeping, 1,128; geometry, 562; physics, 560; French, 1,063; English, 750; modelling, 439; *Fach* schools, 2,726.

In general, it is said of the city continuation establishments that they are designed to supplement the education of such practical workmen as desire to extend or review their studies and learn to speak and write French and English, or to acquire a knowledge of commercial arithmetic and bookkeeping. The tuition fee per half-year is 2 marks (48 cents) for each two hours' course, 4 marks (95 cents) for each four hours' course.

Besides thirteen city continuation schools which are mentioned in the report a continuation school supported by the Artisans' Society is referred to, and three schools of the same character maintained by the Berlin Merchants' Union are enumerated. Respecting the continuation schools for girls (five in number) under city control it is stated that the tuition fee per month in these schools is 1.50 marks (36 cents), exclusive of French and English; a charge of 3 marks (71 cents) per half-year is made for these languages in addition. The subjects taught in these schools include German, arithmetic, bookkeeping, drawing, manual labor, machine sewing, tailoring, singing, and turning. Six continuation schools for girls are reported, all of which are managed by societies.

Mention is made of the city continuation school for deaf mutes. Tuition is free. Reading, German, and arithmetic are taught to both boys and girls; while some form of manual labor is included in the training of the girls. Instruction in this school is given in the evening. Twenty boys and 16 girls belonged to the school at the time the report was made.

For the purpose of securing more definite information than already existed upon some of the results of manual instruction in Germany, and thereby aiding the investigations of this Department, a schedule of inquiries was prepared by representatives of the German Manual Training Association. This schedule was sent to teachers in manual training schools with the request that they should fill it out, as far as possible, in connection with the parents of former pupils.

In the *Blätter für Knaben-Handarbeit* for February 1892 are published the answers received from the teachers in Leipsic school shops. Though the results as stated in the *Blätter* do not show that manual training in every instance has a magical effect—transforming a dull or indifferent pupil into an intelligent and enthusiastic artisan—yet it will not be denied that the replies possess a certain value. It is clear that the questions were answered with the utmost candor by the several teachers; for, while there is no direct conflict of opinion among them as to the utility of manual training in the schools, the conclusions reached are not uniformly favorable. From the *Blätter* a table has been compiled which contains all of the replies that are of special importance.

RESULTS OF MANUAL TRAINING IN LEIPSIC.

Marginal number.	Age.	Occupation.	Kind of training at school.	Half-years at school.	Hours of training per week.	Time under instruction.	Does he show practical ability?
1	16	Bookbinder	Carpentry	2	2	1½ years.	Yes
2	17	Mason	Carving	3	2	2½ years.	In the first year was very unskilful, but much improved by the drawing instruction.
3	18	Joiner	Carpentry Modelling	3 1	2 each	3 years	Yes
4	15	Wood carver	Carving	3	2	5 mos	Yes
5	15	Brewer		3 mos.	4	½ year	Yes
6	18	Joiner	Carpentry	8	2	2½ years.	Yes
7	16¾	Locksmith	Carpentry Metal work	9 4	2 each	2½ years.	Yes
8	16	Carpet maker	Pasteboard work	6	2	3 years	Only when under supervision.
9	15	Wood carver		3	4	1½ years.	Yes
10	16	Locksmith	Carving	3	2	1½ years.	Yes
11	15	Tailor	Carpentry	1	2	¾ year	Yes
12	17	Joiner		6	4	16 mos	Yes
13	18	Joiner	Carpentry	2	2	3½ years.	Yes
14	15½	Box maker	Carving	4	4	1½ years.	Yes
15	18	Joiner	Carpentry	2	2	3½ years.	Yes
16	16	Pianoforte maker		4	4	1½ years.	Hard to determine
17	17	Machinist	Carpentry	3	2	¾ year	Yes
18	16	Wood carver	Carpentry Carving	4 4	2 each	4 mos	Yes
19	15	Mechanic		3	2	4 mos	Yes
20	16	Stone mason	Pasteboard work	6	2	¾ year	(b)
21	14¾	Joiner	Carpentry; carving.	3	4	¾ year	Yes
22	15	Joiner		4	2	¾ year	Yes
23	17	Wood engraver	Carpentry	4	2	1½ years.	Yes
24	15	Printer	Pasteboard work Carpentry Carving	2 2 1	2	4 mos	Yes
25	16	Wood carver	Modelling	6	2	1½ years.	Yes
26	15½	Mechanic		2	2	¾ year	Yes

a No. It were better to give more practical instruction in drawing, which instruction is generally of very little value. Every business man needs drawing.

RESULTS OF MANUAL TRAINING IN LEIPSIC.

ie above the age in man- dexterity?	Does he show an interest in his work?	Is he diligent?	Does the teacher believe that, rightly directed, manual training—			Marginal number.
			Awakens an interest in practical work?	Gives a general fitness for it?	Inspires respect for manual labor?	
't know	Yes	Yes	Yes	Yes	Yes	1
	Yes	Yes	(a)	(a)	(a)	2
	Yes	Yes	No	No	Not under present social conditions.	3
	Yes	Yes	Yes	No; his pupilage was too brief for that.	Yes	4
		Yes	Yes	No	Yes	5
	Yes	Yes	Yes	Yes	Yes	6
	Yes	Yes	Yes	Yes	Yes	7
	Yes	Yes	In general, it is only a pleasant diversion, and its true purpose is not brought out.	No; it only helps children to choose an occupation.	Unfortunately no, so long as the apprentice does not regard what he has learned in the school shop as the sole end and aim.	8
	Yes	Yes	Yes	Yes	Yes	9
	Yes	Yes	Yes	Yes	Yes	10
	Yes	Yes	Yes	He should have worked at something useful for tailoring, not for carpentry.	Yes	11
	Yes	Yes	Yes	Yes	Yes	12
; in contrast th those who ver attended nanual train- g school.	Yes	Yes	To some degree	Yes	Yes	13
	Yes	Yes	At least it gives the young man an insight into practical work which stands him in good stead, and perhaps dispels his illusions. In this view manual training is very beneficial.		Yes	14
	Yes	Yes	No	No	Under existing social conditions it does not.	15
	No	No	Yes	Yes	Yes	16
	Yes	Yes		It is preparatory only.	It may in those who are not artisans.	17
	Yes	Yes	Yes	Yes	Yes	18
	Yes	Yes				19
(b)	(b)	(b)	(b)	(b)	(b)	20
; but only a tle.	Yes	Yes	Yes	Yes; in a small measure.	Yes; to some extent.	21
	Yes	Yes				22
; very much.	Yes	Yes	Yes	Yes	Yes	23
not demon- rable in so ort a time.	Yes	Yes	Yes	Yes	Yes	24
	Yes	Yes	Yes	Yes	Yes	25
	Yes	Yes	Yes		Yes	26

is trade has so little to do with the specialty he pursued in the school shop that it is not possible swer these questions. Yet in the shop the pupil learned to work intelligently, and his sense of y was awakened.

RESULTS OF MANUAL TRAINING IN LEIPSIC—Concluded.

Marginal number.	Age.	Occupation.	Kind of training at school.	Half-years at school.	Hours of training per week.	Time under instruction.	Does he practical
27	14	Brass worker	Metal work	4	2	½ year	Yes
28	15¼	Electrician		2	4	¾ year	Yes
29	15½	Printer	Pasteboard work; carpentry; modelling	4	2	½ year	Yes
30	15¾	Joiner	Carpentry	5	2	¾ year	Yes
31	16	Mason	Carpentry Carving	4 2	4	1¼ years	No; eve has to pared fo
32	16	Locksmith	Metal work	4	2	¾ year	Yes
33	16	Chimney sweep	Carpentry	5	2	¾ year	Yes
34	15½	Steel and copper worker.				1½ years	Yes
35	15	Machinist	Carpentry	5	4	¾ year	Yes
36	16¾	Basket maker	Carpentry	5	2	1 yr. 5 m.	Yes
37	19	Locksmith		8	4	2¼ years	Yes

a It is hard to answer in this case, because he showed the same devotion to his trade before this instruction.

RESULTS OF MANUAL TRAINING IN LEIPSIC—Concluded.

Is he above the average in manual dexterity?	Does he show an interest in his work?	Is he diligent?	Does the teacher believe that, rightly directed, manual training—			Marginal number.
			Awakens an interest in practical work?	Gives a general fitness for it?	Inspires respect for manual labor?	
Yes	Yes	Yes	We think well of this school.	Yes	Yes	27
Clearly so, for his age.	Yes	Yes	Yes	Yes	It is not possible to affirm this of the short period of study. The novelty of the training excites interest.	28
Yes	Yes	Yes	(a)	(a)	(a)	29
Yes; if he continues so he will deserve a broader education.	Yes	Yes	Yes	Yes	Yes	30
Of this I have no experience.	No	Yes	Under favorable circumstances.	Yes; in a single branch.	It is hard to say	31
He is very accurate, and would become a very skilful workman but for ill health.	Yes	Yes	Great interest	I can speak of manual training only in terms of warmest praise.		32
	Yes	Yes	Yes	Yes	Yes	33
	Yes	Yes				34
It has been apparent from the first day that manual training has greatly benefited him.	Yes	Yes	If the apprentice has previously attended a school workshop, it has quickly become evident what industry he is most interested in; this is a preparation of great importance.	Yes	Yes	35
His skill is quite satisfactory.	Yes	Yes	Yes	Yes		36
Yes	Yes	Yes	Yes	Yes	Yes	37

In commenting on the various replies contained in the schedule the writer in the *Blätter* says:

In respect to single unfavorable results the individuality of the pupil is so clearly a factor that failure can not be laid to the charge of manual training. As to the skill and diligence of the pupils, as well as concerning their interest in their pursuits, the testimony is almost unanimous.

Less unanimous are the answers to the question: Is he above the average? And it must be somewhat difficult to give an adequate reply to such a question, for it would require a wide experience in the education of apprentices to render a full answer.

The question: Does the teacher believe that rightly directed manual training fits one, in a general way, for hand work? is not rightly interpreted by many masters, because they lay too little emphasis on the word general (*allgemein*). They think of manual training too much as a special preparation for a trade. But while we do not aspire to promote any industrial object by our manual training, but keep only general education in view, we have good grounds for satisfaction in the testimony of master workmen concerning our instruction.

An artist (whose answers are not included in our schedule for sufficient reasons) testifies of the value of manual training as follows: "Yes, it is of great utility! Manual training should be more extensively practised in our industrial and art schools, for it would give us more useful, competent artisans, and fewer drawing room dilettanti, for our handicrafts. In my judgment every boy ought to attend the modelling and wood carving classes, for it is of prime importance that every one should learn how things are made. Without this training no one can become a clever artist. Every world's exposition has brought to view our deficiencies."

Finally, the writer concludes, workmen are "not inimical to manual training, but know how to value it."

Herr F. Groppler, the famous Berlin teacher, summarizes other replies made to the schedule inquiries in a statistical report on the influence of training for labor upon the industrial activity of former manual training pupils, published in the *Blätter für Knaben-Handarbeit*, for June 1892.

He prefaces his tables with the reminder that the most of the German school shops are yet too young to have exerted any appreciable effect on industry. He observes, further, that until 1891—when the inquiries of this Department brought the subject to their attention—the majority of German school teachers did not keep a list of their pupils, had no communication with their graduates, and no knowledge of the callings they followed.

It was determined by those having charge of the matter to ascertain the opinions of a number of German master workmen concerning manual training, though aware, as Herr Groppler expresses it, that "their judgment would be subjectively colored." Accordingly, a schedule of questions was sent out to 50 of the oldest German school workshops.

To some of these inquiries no answer was returned, but from 22 towns 301 full replies were received. The greater part were filled out

by the master workmen themselves, a smaller proportion by parents or by shop superintendents after consultation with the master workmen.

"We leave out of the account, in thisconnection, questions 1 to 8, which relate to the name, the age, the teacher, etc.," says Herr Groppler, who also doubts whether the specialty pursued in the school workshop exercises any influence on the choice of a calling. In general this influence is thought to be very small at most. The special local industries have much more to do with the result, as, for example, at Markneukirchen all the boys become violin makers.

Herr Groppler remarks:

We confine ourselves, therefore, to the following summary of the questions 9 to 14.

Question 9. Does the apprentice show practical ability? Affirmative, 254; qualified affirmative, 16; negative, 6; no answer, 23.

Question 10. Has he a certain degree of manual dexterity? Affirmative, 254; qualified affirmative, 15; negative, 9; no answer, 23.

Question 11. Is he above the average in this respect? Affirmative, 114; qualified affirmative, 18; negative, 102; no answer, 67.

Question 12. Does he show an interest in his pursuit? Affirmative, 274; qualified affirmative, 10; negative, 7; no answer, 10.

Question 13. Is he diligent? Affirmative, 275; qualified affirmative, 10; negative, 3; no answer, 13.

Question 14. Does the teacher believe that a rightly directed course of manual instruction (*a*) awakens an interest in hand craft and in practical pursuits? Affirmative, 251; qualified affirmative, 6; negative, 7; no answer, 34.

(*b*) That, in a general way, it fits one for such pursuits? Affirmative, 250; qualified affirmative, 12; negative, 19; no answer, 20.

(*c*) That it inspires respect for manual labor? Affirmative, 253; qualified affirmative, 4; negative, 5; no answer, 38.

From all this Herr Groppler concludes that the movement in behalf of manual training has prospered and gained favor among the laboring classes. "This shows us," he adds, "that we are on the right track, and that we should press forward unswervingly."

Since the publication (in 1889) of Herr Sonntag's report on the condition of manual instruction in Germany the movement has made rapid progress there. According to that report there were then in Germany 67 independent schools of manual labor and 97 workshops in connection with other institutions, a total of 164 school workshops. Within the last three years the manual workshops have made a gain of 89, that is, 54 per cent. This gives a total of 253 manual training workshops in Germany. Of these 148 are situated in Prussia, the Rhine provinces heading the list with 29.

In the van of the remaining German states the kingdom of Saxony leads with 33 workshops. Bavaria has 15; Saxe-Weimar, 9; Würtemberg, Bremen, and Alsace-Lorraine, 6 each; Baden, Saxe-Coburg-Gotha, and Lübeck, 5 each; Hamburg, 4; Brunswick, Reuss, and Lippe, 2 each; Hesse, Saxe-Meiningen, Anhalt, Schwarzburg-Sondershausen,

Schwarzburg-Rudolstadt, 1 each. In the 7 remaining German es educational labor training seems to have gained no foothold.

he advance of the new system has been such in all parts of the civi- l world, however, that, according to Schenckendorff, Germany now ıpies the ninth place in the line of states that seek to promote this cational reform. In his enumeration the order of precedence is given ollows: Finland, Sweden, Norway, Denmark, France, England, gium, Switzerland, Germany. America is not taken into the account ll.

he following data as to the cost of materials for instruction, etc., in many are derived from the General Educational News (*Allgemein errichtende Mitteilungen*). The cost of a tool outfit for carving, per il, in Germany is given as 1.72 marks (41 cents); common working s sufficient for 16 pupils, 149.42 marks ($35.56). Cost of tools per il in pasteboard work, 5.45 marks ($1.30); equipments for 20 pupils his department, 118.75 marks ($28.26). In the carpentry depart- ıt the cost of tools, per pupil, is put at 49.80 marks ($11.85); hence, ten benches, 498 marks ($118.52). Shop equipment (ten benches tools), 545.70 marks ($129.88). General outfit of workshop (mate- s, lamps, pails, towels, etc.), 116.50 marks ($27.73). Total cost of ipment for the three departments, 930.37 marks ($221.43).

he current expenses of a workshop per year are—

administration, etc	$35.70
hers' stipend, 9 divisions, at 150 marks for 1 division, 4 hours per week	321.30
ice and cleaning	8.57
ıting	7.14
ting	3.57
erial used	70.21
air of tools, etc	7.14
ks, etc	4.76
dries	15.47
Total	473.86

he equipment of a shop for metal work for the accommodation of pupils is said to cost 96.85 marks ($23.05).

IGHER INSTITUTIONS FOR INDUSTRIAL EDUCATION.

erman schools have a thoroughly systematic organization, by virtue which there occurs no break in the continuity of a pupil's studies passing from a lower to a higher grade. This peculiarity of the man school system differentiates it from that of all other nations. f this fact Sir Philip Magnus takes cognizance in his essay on Ed- tion in Bavaria, published in the monograph series of the Indus- l Education Association, March 1888. He says:

'othing is more difficult than the endeavor to classify English schools. regards the elementary schools, there is, of course, no difficulty ause they are all organized on the same plan; but as soon as w

proceed one step higher in the educational ladder the difficulty of presenting in a tabular form the various grades of secondary schools is very considerable. * * * Where the foreign system seems to me to be undoubtedly superior is in the closer definition of the objects which each school endeavors to fulfil. * * * Another defect in the English school system, arising from want of organization, is that different schools which ought to aim at educating different classes of pupils overlap one another in their aims and objects, and are with difficulty distinguishable.

* * * * * * *

A typical example of the organization of German schools is presented in the school system in Bavaria. This system is well illustrated in the city of Munich, which contains specimens of all the different schools existing throughout the country. * * * The population of Munich is about 230,000, and it contains 20 elementary schools, the average attendance at which is nearly 25,000 children, or 1 in 9 of the entire population. * * * The ordinary elementary school age is between 6 and 13, and it is scarcely necessary to say that elementary education is compulsory. * * * No child can leave the elementary school until he has attained the age of 13; and even then, if he at once enters industrial life, he is required to attend, during the evening, what is called a continuation school, where the instruction consists of the same subjects as are taught in the primary school, further continued, in addition to elementary science, bookkeeping, and what may be called industrial drawing. * * * These continuation schools are held on the evenings of the week-days and on Sundays. In 1884, throughout Bavaria, there were 273 such schools in which 1,223 teachers were engaged; and in Munich only, the attendance in these schools averages about 3,194 yearly.

In the case of those intending to take a higher educational course it is permissible to leave the elementary school (*Volksschule*) at 10 years of age, and enter the *Realschule*, if able to pass the entrance examination.

In Bavaria there are about 46 such schools, in 34 of which the course of study occupies six years, and in 12, four years. The course of study comprises German, at least one other modern language, science, mathematics, and drawing. Latin is not taught, nor is there any workshop instruction. At the age of 16 the student may pass to the technical college or *Industrieschule.*

The aim of these schools is to enable the students to obtain a practical education, less theoretical in character than that given in the universities or at the polytechnic schools, which shall adapt them to at once enter upon commercial or industrial work, with a fair chance of immediate employment, and of obtaining steady promotion in their careers. The school course lasts two years.

Workshop instruction has only of late years been given in the technical schools of Germany. In the *Realschule* leading up to this college no such instruction is given, and the opinion is still very generally held throughout Germany that practice in the use of tools is best commenced in the commercial works, and that the period devoted to school education should be wholly occupied in the teaching of principles.

There is, however, a gradually increasing tendency to adopt the opposite view, and the importance attached to workshop instruction in other countries, notably in France and in the United States, is not without effect on German educationists.

The opinions received from different authorities as to the value of these schools varied very much. More than one of the professors of the university attached very little value to the instruction. On the other hand the testimony of managers of machine works in Bavaria, who had had the opportunity of testing the results of the training given in these *Industrieschulen*, is very much in favor of the education they provide.

An English foreman, engaged in the works of a large machine maker at Nuremberg, referred to it in the highest possible terms, and distinctly stated that he gave a decided preference to boys who had received, during their school course, some amount of shopwork instruction.

After discussing German university education Sir Philip Magnus says:

In this bird's-eye view of Bavarian education I have made no reference to schools of art, to schools of commerce, nor to schools for the instruction of women. To give a full description of the splendid Art School of Munich would alone form subject matter for an interesting paper. * * * Such a school, provided with the necessary plant and apparatus for the execution in the material itself, be it glass, porcelain, wood, metal, or some textile fabric, of the design prepared by the artist, affords facilities for experimental art work which, when successful, may be, and often is, the means of introducing into the country new industries. * * * There are in Bavaria other educational institutions, fulfilling various purposes, such as training colleges for teachers, music and dramatic colleges, needlework schools, military, and veterinary schools.

In conclusion the author remarks:

An acquaintance with the German system shows that, notwithstanding many undeniable objections, there is much to be said in favor of state control of secondary and higher education. The rivalry among different schools, the competition for pupils, involving various forms of expensive advertisement, which characterizes the free system of England, does not exist in Germany. The government takes care that each district is provided with the schools adapted to its wants, and the curricula of these schools are determined by the requirements of the people. The gradation and coördination of schools under such a system is far more complete than is at present possible in England.

From recent consular reports we obtain some suggestions as to the commercial advantages that accrue from the technical schools of the continent. In the German empire there are understood to be 250 such schools; and to their influence is attributed, in part, Germany's ability to compete successfully with the nations of the world in manufactured products.

Mr. James H. Smith, United States commercial agent at Mentz, remarks that these schools play an important part in promoting the

prosperity of Germany's foreign trade; and thinks that the disposition shown in the United States during the last few years to introduce into the schools of the country the training of the hand as well as of the eye, if generally and intelligently carried out, can not fail to be of incalculable benefit to the country, and produce a nation of skilled workmen whose productions will raise our country to a height of industrial excellence unsurpassed by any country, and challenge the admiration of the world.

More specific still is the statement of Consular Agent Neuer, of the United States agency at Gera. After describing the Gera weaving school—essentially like the one at Crefeld, already referred to—he says:

I commend this system of technical education as well worthy of the serious consideration of our manufacturers, as specially trained and skilled operatives must be of vast service to us. It is an important factor and closely connected with the highest interests of our laboring classes.

In this connection I draw attention to the English parliament having recently suggested the establishment of technical schools according to the German system. The advancement of German commerce in all parts of the world is generally admitted; and while cheap German labor, as well as the weighty governmental aid, may partly account for this fact, it is no less the superior schooling which opens to this country new markets. Our merchants ought to adopt the same methods to strengthen our manufacturing industries.

The Bradford correspondent of the Irish Textile Journal writes interestingly, in the July 1890 number of that periodical, concerning the Industrial Society of Mülhausen, in the province of Alsace. Under this society's supervision various technical schools have been established, chiefly for teaching all branches of the textile industries. His communication concludes as follows:

The system as carried on at Mülhausen ought to be adopted by those engaged in the various industries of this country, and every means taken to render it as efficient as possible, and the lead that we have undoubtedly had in most of the manufacturing trades up to the present would still be retained by us. There is certainly a lack of spirit amongst a majority of the employers in the British Isles in many matters which, with a little tact and outlay, would amply repay them in the long run; but, notwithstanding that such rapid strides have been made during recent years in the improvement in the conditions of labor, in the general welfare of the working population, and in the advance of technical education, there still remains much to be done in order to keep well ahead, in industrial and scientific matters, of other nations, and a leaf taken out of the book of the Technical Industrial Society of Mülhausen, and thoroughly digested by all those interested in the future of this country, would greatly tend to uphold our present supremacy in the leading industries. Those specially engaged in the making of textile goods, and in the various classes of machinery for their production, ought to take up this question with spirit.

From the report of the factory inspectors of the German empire

for the year 1887 United States Commercial Agent Smith, of Mentz, condenses into an interesting abstract some accounts of the general industrial situation in that country for Consular Report No. 103, of March 1889. In this abstract it is stated that—

A school regularly intended for industrial education is known as a *Gewerbeschule*, that is, industrial school, and when the school is devoted to a particular line of work, or branch of industry, it is often called a *Fachschule*. * * *

Fachschulen, that is, schools for teaching a particular line of work, do not exist all over the empire, but are met with chiefly in localities in which the branch of industry for which they are especially designed flourishes most, as, for instance, the *Fachschule* for small ironware and steel, at Remscheid; for casting, at Bochum; for ceramics, in the Kassel-Wiesbaden district; for industrial art, at Carlsruhe; for watchmaking, at Furtwangen in Baden; for weaving, dyeing, etc., at Crefeld, and to a considerable extent in Saxony; for brewing and milling, at Worms; for the polygraphical industry, at Leipsic.

A large number of *Fachschulen* are in the Chemnitz district. In the heart of the toy-making district, at Grünhainichen, there is a *Fachschule* for teaching drawing, painting, and modelling to young toy makers. These *Fach* schools are maintained either with public money or by guilds.

United States Consul Monaghan, of Mannheim, who has visited and carefully inspected the industrial school at Pforzheim, gives the results of his observations in a valuable paper published in the May number of the United States Consular Reports of 1890. It is plain that in this case, as in most cases, the school in question had a utilitarian purpose. We are not left to infer this for Consul Monaghan says:

The origin of these schools is due to the enterprise of Pforzheim's jewellers. The first steps toward its creation were taken after need for great skill in designing and a better knowledge on the part of the workmen of the laws of beauty, taste, harmony, metals and their manipulation was felt by manufacturers desirous of holding what they had long possessed and of making new conquests in the world's markets.

Still further, he notes the care exercised by German jewellers to study universal art and adapt their wares to racial tastes:

Tons of stuff are going to America. Mexico takes immense quantities; so do all the South American states. The extending and securing of these markets is due very largely to the industrial and art industrial schools. * * *

The schools are here, never to go. The sooner we get them in the United States—for get them we must if we will hold our home markets, to say nothing about foreign—the better

Finally, Consul Monaghan concludes:

The argument, if such it can truthfully be called, so often indulged in by American writers and educators, that the best of such schools can give little if anything more than theory, has here absolutely no application. The industrial schools here are the quintessence of practicability. The manager who wants a boy trained by a practiced, skilful workman gets him.

The teachers who morning after morning turn to the right to go into

school building to give instructions are, every one, men who could asily turn to the left, go down any of the city's lanes, enter any of workshops or factories, put on aprons, and take their places by the of the very best in stamping or finishing room.

The best argument, perhaps, for establishing them in lands where y are as yet unknown is found in their steady, rapid, and wide exsion in this and neighboring countries, and in the fact that when e government, if it ever should, resolves to support them no longer, e manufacturers themselves will provide money, and generously, for, eir continuance.

In continental Europe, and particularly in Germany and France here are flourishing agricultural schools of various grades.

To Prof. Thaer, who as long ago as 1810 was appointed to the chair f agriculture in the University of Berlin, is given the credit of having rganized the first system of agricultural education in Germany. To im, also, is attributed the dictum, which today would be everywhere eceived as a self evident truth, that "agriculture can not be perfectly earned by attending lectures from the professorial chair."

Since Thaer's day there has been a wonderful development of agricultural institutions in Germany, until now no less than 13 institutes of the university rank are fully equipped for imparting instruction in the science and art of agriculture in that empire, while a multitude of schools of lower grade are devoted to this important specialty.

As an example of the former class we may take the Agricultural High School at Berlin. The instruction here is of a purely scientific character, as, indeed, it could hardly be experimental and practical in a large city. The building occupied by the school contains an extensive museum in which agricultural implements of every description are displayed for the benefit of the students. The botanical collection contains several thousand specimes of wood of different kinds, and over 18,000 specimens of corn, seeds, and fibres, which include samples of the various kinds of artificial feeding stuffs.

The zoölogical and zoötechnical collections are equally as complete, including various species of domesticated animals, and the different breeds of them which exist in Europe and other countries. Skeletons, models, photographs, and pictures form together a more complete synopsis of the animals of the farm than can probably be found in any other institution. The wool collection alone is a marvel of completeness, for not only does it contain specimens of the wool of different breeds, but also that of different flocks of each breed. It is further divided into two portions—one historical, to show the gradual development of the production of wool by means of cultivation and selection, and the other technical, to show the applicability of the various sorts of wool to the manufacture of the different kinds of fabrics, and the effect of manufacturing processes upon the varieties of the raw material.

The teaching staff of this school includes many distinguished men. There are, according to the latest available report, 12 regular teachers,

19 assistant teachers and private docents, and 55 instructors of lower rank in the school. The whole number of students is given as 432, but many of these were members of the university, attending special lectures of the agricultural school. The fees for students are fixed by the minister of agriculture, and amount to about $50 a year. The government grants a subvention to the school equivalent to $45,000 annually.

The Poppelsdorf Agricultural Academy deserves mention especially on account of its course of instruction in agricultural engineering, such as does not exist elsewhere in Europe. It would conduce greatly to the usefulness and popularity of American agricultural colleges if they were to introduce a similar course of special instruction. In vast regions of the West millions of acres lie fallow and useless, which, under the hand of a competent agricultural engineer, having a thorough knowledge of mechanics and hydraulics, of drainage and of irrigation, might easily be reclaimed and made abundantly productive.

At Halle there is an agricultural institute of high rank, having a[illegible] average attendance of 300 students. Connected with this institute [illegible]s an experimental farm of 100 acres, and botanical and zoölogical garden[illegible]s. In the zoölogical garden is kept a variety of farm animals which ser[illegible]ve as living specimens to illustrate the lectures given by the professo[illegible]rs. The course of instruction extends over two years; and the entire cost [illegible] of living and tuition at this institute does not exceed $200 per annum [illegible] for each pupil.

Of the intermediate agricultural schools (*Landwirthschaftsschulen*[illegible]) in Germany there is an indefinite number. In Prussia there are 16 w[illegible]ith more than 1,100 pupils. These schools receive a subsidy from the s[illegible]ate and take rank with American high schools—the classics being displaced in part by agricultural instruction, and modern languages substituted for Greek in the curricula.

Dr. Michelsen, director of the school at Hildesheim, is of the opinio[illegible] that the instruction given to the small farmers of that district has e[illegible]abled them to grow successfully the sugar beet, the culture of whic[illegible] requires great care and intelligence.

The *Ackerbauschule* of Germany is a farm school of lower grade. I[illegible] Prussia there are said to be 32 of these schools, some of which are [illegible] connected with the intermediate schools, while others are boarding [illegible] schools established on an independent basis. The farm schools, like [illegible] most good institutions in Europe, are maintained largely by state aid. [illegible], though local authorities contribute also to their support.

In Badersleben one of these farm schools is established on an ol[illegible] convent farm of 500 acres, with accommodation for 70 pupils. Boy[illegible] between 14 and 17 years of age are admitted to the school. The cour[illegible] of study occupies two years. Here, on a 2-acre school garden, t[illegible] pupils are taught the proper rotation of crops and the best methods [illegible]

cultivating the common agricultural staples. The expense of tuition, board, etc., is about $100 a year per pupil.

The time of the students is mostly devoted to general or special study, only just enough of practical work being undertaken to enable them to become acquainted with all the operations of agriculture. On leaving the school most of the students become foremen of their fathers' or neighbors' farms, and thus share with others the advantages of the instruction they have received.

Another powerful agency for the diffusion of a knowledge of agriculture, and for stimulating an interest in its pursuit, is often brought into requisition in Germany; this is the travelling lectureship. Through this means practical farmers are taught the latest scientific discoveries and the best modes of utilizing them.

Before dismissing the subject of agricultural instruction in Germany we wish to refer briefly to the special schools, which have for their object the thorough preparation of their pupils for some single branch of work more or less directly connected with agriculture.

Of this class are the dairy schools, such as that at Gross Himstedt. There, on a farm of 150 acres, 35 or 40 milch cows are kept, and dairying in all its branches is efficiently taught to young women, who pay what seems the merely nominal fee of $90 apiece per year for board, lodging, and instruction.

In this school the morning hours are set apart for service in the dairy; but in the afternoon the pupils are taught writing, arithmetic, history, geography, and receive lessons in sewing and cooking.

Economical management of a dairy is demonstrated to be possible at this school, since one pig is kept for each cow on the farm, and is fattened on whey and buttermilk. Six oxen and 150 sheep are also fattened annually. The cows are kept in stalls all the year round; but they have plenty of green food—in early spring green rye, and later, green grass and clover.

Provision is made for the instruction of only six pupils at one time in this school; and the only feature which differentiates the school from similar dairying establishments in England is the instruction here given in common branches of education. But this collateral teaching is of considerable importance to the class of pupils in attendance.

Technological schools of forestry, of drainage and irrigation, etc., are numerous in Germany. Among the most useful of these are the shoeing schools.

One such school established at Grimmen a few years ago by Herr Koch, royal veterinary surgeon of the Greifswald district, has been of great service in lessening hoof diseases and lameness caused by faulty shoeing. Herr Koch, the founder of the school, insists that a shoer of horses should have a thorough knowledge of the anatomy and physiology of animals' legs, and especially of the horse's hoof or great toe.

The museums of various kinds which are connected with the agri-

cultural and other industrial schools of European countries are important educational adjuncts. The American system of agricultural fairs, or occasional exhibits of agricultural products, are, for educational purposes, of slight value, compared with these permanent local museums, freely open and accessible to the people, in which are arranged and scientifically classified specimens of flora and fauna; and, conformably to some definite plan or chronological order, models of agricultural implements, collections of improved educational appliances, and productions of industrial and technical art. These collections are to the people an unfailing source of inspiration and a constantly suggestive stimulus.

More than five thousand specimens of industrial art products were added to the collections in the agricultural museum of Würtemberg during the year 1889.

Among the influences which tend to raise the standard of general education in Germany, and to make students emulous of reaching the higher grades of schools, is the natural desire to escape from the three years' military service which the government exacts of all young men who do not enter the higher institutions of learning. On condition of pursuing advanced studies the student is exempt from the irksomeness of a long term of military duty, and is privileged to take what is called the voluntary service of one year's duration in the army. This immunity can be secured only by prolonging the period of school attendance and, accordingly, the German youth chooses what he considers the lesser of two evils.

Among the testimonials to the value of the teaching in the continuation schools of Germany may be cited the letter of Herr Back, director of the Frankfort school, to a representative of this Department. Under date of August 6, 1891, he writes that this discipline inspires the pupil with enthusiasm and love (*Lust und Liebe*) for his calling and educates him for his trade as the workshop alone could not.

Of similar tenor is the letter of the burgomaster of Strasburg to Herr Groppler of Berlin, in which he says: "I can testify only that, as a rule, the pupils trained in your courses of manual work are far more skilful and more serviceable than others."

INDUSTRIAL TRADE SCHOOLS AND CONTINUATION SCHOOLS IN PRUSSIA.

Memoranda of the Development of Industrial Trade Schools and Continuation Schools in Prussia (*Denkschriften über die Entwickelung der gewerblichen Fachschulen und der Fortbildungsschulen in Preussen*), during the years 1879 to 1890, is the title of a voluminous report by Herr Lüde of Berlin.

A partial list of the schools, with the location of each institution, as follows:

CONTINUATION AND TRADE SCHOOLS IN PRUSSIA.

Location.	Name of school.		Estimated expenses, 1891-'92.	Attendance winter of 1890-'91.
	English.	German.		
Nienburg	Work school	Baugewerkschule	$11,065.81	223
Eckernförde	Work school	Baugewerkschule	11,612.02	191
Hörter	Work school	Baugewerkschule	11,143.16	296
Idstein	Work school	Baugewerkschule	8,800.53	222
Deutsch-Krone	Work school	Baugewerkschule	11,057.48	224
Breslau	Work school	Baugewerkschule	8,334.28	208
Berlin	Work school	Baugewerkschule	9,710.40	217
Crefeld	Weaving, dyeing, and finishing school.	Webe-, Färberei- und Appreturschule.	13,304.20	288
Mülheim-am-Rhein	Weaving school	Webeschule	2,389.52	54
Spremberg	Weaving school	Webeschule	2,496.62	31
Kimbeck	Weaving school	Webeschule	1,428.00	22
Cologne	Industrial drawing school.	Gewerbliche Zeichenschule.	668.54	64
Elberfeld	Industrial drawing school.	Gewerbliche Zeichenschule.	888.22	145
Cassel	Drawing and industrial art school.	Gewerbliche Zeichen-und Kunstgewerbeschule.	8,211.00	513
Königsberg	Provincial art and handwork school.	Provinzial Kunst-und Handwerkschule.	4,400.62	113
Dantzic	Provincial art and handwork school.	Provinzial Kunst-und Handwerkschule.	1,942.08	81
Hanau	Drawing academy	Zeichenakademie	15,019.94	429
Dusseldorf	Industrial art school	Kunstgewerbeschule	9,900.80	237
Frankfort	Central German industrial art society.	Kunstgewerbeschule des Mitteldeutschen Kunstgewerbevereins.	21,056.34	294
Berlin	Industrial art museum	Kunstgewerbemuseum	.....	.....
Grenzhausen-Höhr	Trade school of ceramic art.	Keramische Fachschule	1,987.30	47
Iserlohn	Trade school of metal industry.	Fachschule für Metallindustrie.	7,477.01	42
Remscheid	Trade school of small iron and steel wares.	Fachschule für die bergische Kleineisen-und Stahlwaarenindustrie.	9,662.80	100
Bochum	School of iron manufacture for the Rhine provinces and Westphalia.	Rheinisch - westfälische Eisenhüttenschule.	6,402.20	90
Waldenburg	Work school of the society for the advancement of the welfare of the working classes.	Arbeitschule des Vereins zur Förderung des Wohles der arbeitenden Klassen.	.....	.....
Berlin	Artisans' school	Handwerkerschule	22,923.21	2,204
Sorau	Linen weaving school	Leinenwebeschule	1,523.20	57
Flensburg	Trade school for ocean steamship machinists.	Fachschule für Seedampfschiffsmaschinisten.	5,057.50	43
Magdeburg	Industrial art and artisans' school.	Kunstgewerbe-und Handwerkerschule.	14,527.52	1,093
Falkenburg	Weaving school	Webeschule	3,284.40	17
Kummelsburg	Workshops for weaving instruction.	Webereilehrwerkstätte	1,142.40	14
Berlin	Weaving school	Webeschule	8,330.00	308
Aachen	Industrial drawing and industrial art school.	Gewerbliche Zeichen und Kunstgewerbeschule.	5,964.28	662
Aachen	Industrial (day) school	Gewerbliche Fachschule (Tagesschule).	4,569.60	126
Hanover	Artisans' and industrial art school	Handwerker und Kunstgewerbeschule.	19,165.43	1,412
Dortmund	Master workmen's school for machinists, locksmiths, etc.	Werkmeisterschule für Maschinenbauer, Schlosser und Schmiede.	7,209.73	37
Buxtehude	Work school	Baugewerkschule	11,440.42	126
Magdeburg	Work school	Baugewerkschule	12,076.12	118
Nowawes	Weaving school	Webeschule	2,261.00	69
Forst	Weaving school	Webeschule	1,547.00	.....
Sommerfeld	Weaving school	Webeschule	1,856.40	23
Finsterwalde	Weaving school	Webeschule	1,237.60	.....
Aachen	Weaving school	Webeschule	7,925.40	100
Posen	Work school	Baugewerkschule	3,580.47	.....
Magdeburg	Master workmen's school for machinists, smiths, and locksmiths.	Werkmeisterschule für Maschinenbauer, Schlosser und Schmiede.	6,961.50	.....
Halle	Industrial drawing	Gewerbliche Zeichenschule.	5,688.20	383

CREFELD.

The institution now known as the Crefeld School of Weaving, Dyeing, and Finishing has existed as a weaving school of a high order since the year 1855, and, thanks to the powerful support of the Prussian royal minister of education, as well as that of the city council and chamber of commerce of Crefeld, it has been thoroughly reorganized for the purpose of theoretical and practical instruction. Its object is to educate master workmen, pattern designers, and mechanics for every branch of weaving, and also to equip machinists for the textile industry, as well as to impart to young people who wish to engage in the business of manufactured wares, either as purchasers or sellers, a sufficient knowledge of the process of manufacture so that they may be able more accurately to appreciate values.

In order to fulfil thoroughly this object the course of instruction includes the teaching of weaving from the most various kinds of raw materials, the speediest and most exact execution of pattern designs, guidance for the independent invention of new patterns, and for calculating the value of materials, and the most preferable method of manufacture.

These special studies are cultivated: Manufacturing bookkeeping, the elements of machinery, power machines, spinning and finishing, the setting up of hand looms, and other practice in the workshops (wood and iron). Herr Emil Lembcke is director of the Crefeld school.

The course of study is of two years' duration. In the first year instruction is given in drawing and pattern work, with special reference to the different branches of textile industry. The composition and decomposition of fabrics are taught and illustrated by means of lectures; and practical weaving of small patterns in cotton, wool, linen, silk, and the like, on the hand loom, is also a part of the first year's course.

Lectures are given on the parts of machines, as well as on the construction, setting up, and manipulation of hand looms, and other apparatus of hand weaving. Exercises in sketching the parts of a machine are practised, and the pupils are required to make calculations for the manufacture of fabrics from raw materials of all sorts, and to study the bookkeeping of the factory.

In the second year these studies are pursued farther; especially is attention paid to the independent designing of patterns for the textile industry. Geometrical and machine drawing, lectures on patterns of earlier centuries, etc., come in here. The designing of new, artistic patterns for weaving and printing is given special prominence. Pupils in this course draw and paint from nature.

In the higher department of the second year composition and decomposition are carried forward together with calculations for large pattern weaving. Here, too, are taken up practical exercises in weaving cotton, wool, half wool, linen, jute, and silk material on the power loom.

Mounting and dismounting of the loom, practice at the power loom, exercises in silk spinning and in spooling various materials, also practice in smith and locksmith work, and in cabinetmaking are the order of the day.

The preference is given German applicants for admission to this school; and foreigners are received only when vacancies exist. Applicants must be at least 14 years old. The school year lasts from Easter to Easter.

The tuition fee for Prussians is for one half-year, lower division, 60 marks ($14.28); upper division, 90 marks ($21.42); trade division, 50 marks ($11.90). For subjects of the German empire, other than Prussians, for one half-year in lower division, 90 marks ($21.42); upper division, 135 marks ($32.13); trade division, 75 marks ($17.85). For foreigners, for one half-year in lower division, 240 marks ($57.12); upper division, 360 marks ($85.68); trade division, 200 marks ($47.60). All fees are payable in advance.

Pupils of the weaving school who wish at the same time to take the course in dyeing and finishing connected with the institution have the following fees to pay: Natives, per half-year, 100 marks ($23.80); German subjects, other than Prussians, 150 marks ($35.70); foreigners, per half-year, 400 marks ($95.20). Prussians only are admitted as "guests." They are required to pay, in the lower division, for fifteen hours per week, for the half-year, 12 marks ($2.86); for one day per week, for the half-year, 30 marks ($7.14); for two days per week, for the half-year, 40 marks ($9.52). In the upper division, for ten hours per week, for the half-year, 18 marks ($4.28); for one day per week, for the half-year, 45 marks ($10.71); for two days per week, for the half-year, 60 marks ($14.28). Pupils who take drawing only pay, per half-year, 30 marks ($7.14). Pupils who attend Sunday instruction only pay, per half-year, 24 marks ($5.71).

In connection with the school are well equipped workshops; and in each shop are stationed three teachers, under whose supervision the pupils have an opportunity to learn practical locksmith work and cabinetwork. These shops, as well as the other rooms of the establishment, including the weaving hall, are lighted by electricity.

The institution has a library of about 2,000 volumes, exclusive of *Fach* literature, a collection of patents of the German empire, and holds for distribution (on certain days of the week) among the teachers, pupils, and the public about sixty journals devoted to the textile industry.

Besides the necessary apparatus, models, and machines for instruction in weaving and spinning the school possesses a large collection of modern weaves, and a valuable, well arranged collection of patterns for weaving, etc., which is of the greatest use to the student. The greater part of this collection is under glass, and so arranged that pupils of the institution may make copies of patterns, designs, and industrial products at specified hours of the day.

This museum is under the supervision of Herr Paul Schulze, and the collection contains over 5,000 numbers. Among these objects are Byzantine weaves of silk of the fourth to the tenth centuries; Saracen silk weaves, tenth to thirteenth centuries; early Italian silk weaves, thirteenth to fourteenth centuries; Gothic silk weaves, fourteenth to fifteenth centuries; Renaissance, half silk, sixteenth to seventeenth centuries; Renaissance, half silk, Italian, Spanish, French; Renaissance, satin weaves, sixteenth and seventeenth centuries; Renaissance, linen weaves, German, white and colored, sixteenth and seventeenth centuries, and so on; a vast and well assorted collection illustrative of the art of weaving in all its branches down to the present time.

The dyeing and finishing school has large collections of physical and chemical instruments, models, preparations, etc., and a department fully equipped with machinery and apparatus for the practice of dyeing, bleaching, printing, and finishing. The present dyeing and finishing school came into existence in the autumn of 1883, in connection with the Crefeld weaving school, under the direction of Dr. H. Lange.

The object of this department (which occupies the east wing of the new weaving school building) is to give to those who wish to devote themselves to the special study of chemistry, by means of the most thorough and practical instruction, as complete an education as possible in all branches of this science and its relation to practical life; and to instruct such as desire to educate themselves for the dyeing industry in special chemistry, dyeing, bleaching, printing, and finishing; in the manufacture of dye stuffs; in the methods of experimentation with natural and artificial dye stuffs; the preparation of chemicals; the cost of dyes; the independent prosecution of these operations; and, finally, to prepare the pupils for practical life through practical work in dyeing, etc.

The institution possesses two chemical laboratories, one large dyeing laboratory, and a laboratory equipped in accordance with the requirements of modern manufacture with the most perfect appliances and labor saving machines for dyeing, etc. In the first (the chemical laboratories) special attention is given to qualitative and quantitative analysis, particularly to practical chemistry. In the dyeing laboratory are conducted experiments with dye stuffs; in short, all operations connected with dyeing, bleaching, etc., are carried on. In the dyeing, printing, and finishing laboratory cotton, wool, linen, jute, silk, etc., are bleached, dyed, printed, and finished on a large scale.

Attendants of this institution come not only from the best known industrial establishments of Crefeld, but from the neighboring cities in the great industrial districts on the right and left of the Rhine. Pupils who wish to attend this institution must be at least 16 years of age, and be well grounded in the elements of chemistry and physics.

Tuition for Prussians, per half-year, is 100 marks ($23.80); for other Germans, 150 marks ($35.70); for foreigners, 400 marks ($95.20). In-

digent and very diligent students may have a partial remission of these fees.

The laboratory may be used by students without cost, and chemicals and reagents are free, except nitrate of silver, platinum, and chloride of gold. Every student that has attended the laboratory instruction for at least one year receives a certificate on leaving the establishment. The laboratory is open daily from 8 a. m. to 12 m. and 2 to 6 p. m., except Saturday afternoons.

United States Consul-General Raine cites a signal instance in the case of the Crefeld school of the effect of trade school instruction upon a local manufacturing industry.

Some years ago, he writes, the Crefeld industry was nearly ruined; the old manufactories were unable to struggle any longer against French, English, and Swiss firms. A few Crefeld manufacturers, dejected but not discouraged, founded in their city a weaving school, and this soon changed the situation. Now the Crefeld factories contest with even Lyons for the supply of the markets.

SPREMBERG.

The weaving school at Spremberg, which has been in operation since 1869, is designed to afford theoretical and practical instruction to those persons who wish to fit themselves for manufacturers, master workmen, etc., in the wool weaving industry, especially in the manufacture of cloths and buckskin materials (for bookbinding). This is a state school.

The tuition fee for Prussians is, in the under class, per half-year, 110 marks ($26.18); in the upper class, 90 marks ($21.42). For all other pupils in the under class, per half-year, 120 marks ($28.56); upper class, 100 marks ($23.80).

There are six teachers, with salaries as follows: Director and first teacher, 4,000 marks ($952); second weaving teacher, 2,400 marks ($571.20); first master weaver, 1,200 marks ($285.60); second master weaver, 1,000 marks ($238); teacher of chemistry, 650 marks ($154.70); teacher of bookkeeping, 250 marks, ($59.50).

The total expenditure of this establishment was 15,190 marks ($3,615.22).

BERLIN.

The School for Manual Laborers in the city of Berlin had 41 teachers at the end of the year 1885, while the pupils in attendance during the summer numbered 1,038 and during the winter 1,485.

The cost of maintenance for the year is stated to have been 75,897 marks ($18,063.49), of which amount 16,891 marks ($4,020.06) came from tuition fees, 26,802 marks ($6,378.88) from the state, and 32,204 marks ($7,664.55) from the city funds. Instruction is given at this school in mechanics, painting, joinery, etc.

The Berlin Handworkers' Union maintained a school for masons during the year, under the direction of 21 teachers, with 168 students who were taught "theory, drawing, and projection," at a cost of 32,286 marks ($7,684.07), of which sum the students paid 15,750 marks ($3,748.50), the remainder being made up in equal proportions by the state and the commune.

The School for Chairmakers (now the City Weaving School) had 210 students in summer and 246 in the winter, ranging in age from 14 to 37 years. This school derives its support from tuition fees, state and city aid, etc.

A trade school for masons and carpenters was also conducted during the year by 3 regular teachers and 3 assistants. Besides this a school for indoor joiners, with 4 teachers and 190 students, was supported by the usual means. In this school industrial and free-hand drawing held an important place.

In addition there were special schools for bookbinders, for painters (founded by the Painters' Union), for barbers, for carpetmakers, for bakers, for smiths, and for tailors.

Associations churches, and institutes in the city seem to have supplemented the work of the special schools, and to have made liberal provision for continuation schools of various kinds.

It is no wonder that the German craftsman, with so many incentives to study, with so many facilities for acquiring skill in his trade, and living in an atmosphere of industrial thought, becomes the accomplished specialist that he is.

The Weaving School is supported by the state, the city, and by contributions of those interested in textile industries, etc. There are two departments—the day school, and the school for evening and Sunday instruction. The object of the day school is to give theoretical and practical instruction in weaving to those merchants and manufacturers who devote themselves to textile specialties.

The department of evening and Sunday instruction serves to perfect apprentices and journeymen in the specialties of weaving in which they are practically engaged.

In the day school the tuition fee for the first school year is 300 marks ($71.40); for the second year, 100 marks ($23.80). "Guests" pay 5 marks ($1.19) for each week of teaching. Merchants who attend the Sunday and evening departments pay 3 marks (71 cents) for each week of instruction, while artisans have no tuition to pay for attendance in this department. There are two divisions of the day school; one is taught from 8 a. m. to 12 m. every day, the other from 2 to 6 p. m.

In the Sunday and evening division instruction is given in free-hand drawing, analysis and composition of fabrics, hand and power loom weaving, pattern drawing, theory of weaving, working of stocking machines, decomposition of yarns, practical and theoretical mechanics of stocking machines, etc.

According to the report of February 1891 the number of pupils in the day weaving school was 26; in the Sunday and evening school, 280.

At the Masons and Carpenters' School young people who have already worked for some time at a building trade may be further instructed in their respective specialties (as building construction, knowledge of materials, etc.), concerning which little could be learned in actual business, except by disastrous experiment.

Master Builder Felisch is the superintendent of this school, in which 493 pupils were enrolled during the year. The masons were divided into 9 classes and the carpenters into 5, for the purposes of instruction. The tuition fee is 5 marks ($1.19) per half-year.

The School for Joiners is intended to give (aside from the practical skill acquired in the workshop) such knowledge as is requisite for an independent journeyman or master. The instruction includes free-hand drawing, projections, and special drawing (*Fachzeichnen*). Tuition is free. Instruction is given from 8 a. m. to 12 m. for 40 Sundays per year.

There are also two other courses—one a preparatory course in special drawing, the other a separate course of instruction in the use of working tools and in respect to the properties and qualities of materials. In these preparatory classes the teaching is carried on in the evenings of Monday and Tuesday. The number of pupils was 409.

The School for Shoemakers is supported in part by the state, in part by the city, by the Sunday Free School Society, and by the guild. Tuition is free for apprentices, but journeymen or masters pay 1 mark (24 cents) quarterly for instruction.

The theoretical teaching is confined to the evening classes. The technical instruction is given from 9 to 12 on Sunday forenoons and from 7 to 10 on Tuesday evenings. The number of pupils was 350.

The School for Painters (sustained by the state, city, and guild) furnishes free instruction to apprentices of members of the guild, while helpers have to pay 9 marks ($2.14) per semester.

From November to March the evening classes are taught, on week days, from 5 to 8 o'clock. The day classes are held from half past 1 to 4 o'clock every afternoon, and from 9 to 12 on Sunday forenoons. The pupils numbered 360.

Other *Fach* schools of Berlin were the Barbers' School with 399 pupils, the Saddlers' School with 120 pupils, the School of Interior Decorators with 175 pupils, the School for Smiths with 114 pupils, the Glaziers' School with 64 pupils, the School of the Chimney-sweepers' Guild with 81 pupils, the Wheelwrights' Guild School with 83 pupils, the School of the Basketmakers' Guild with 36 pupils, the School of the Berlin Bookbinders' Guild with 41 pupils, the School for Printers' Apprentices with 213 pupils, a school for painters with 88 pupils, School for Bakers' Apprentices (supported by the Bakers' Guild Germania) with 153 pupils, the School for Apprentices of the Bakers' Guild Concordia

with 98 pupils, the School for Tailors with 95 pupils, the School of the Wig-makers' Guild with 86 pupils, the Pavers' Guild School with 91 pupils, the School for Confectioners with 35 pupils, the School of the Printers' Guild with 40 pupils, and the Potter's Guild School with 56 pupils.

There were altogether 11,956 apprentices under instruction in the continuation and *Fach* schools of the city of Berlin during the school year 1890.

The Royal Museum of Industrial Art offers instruction in special classes daily from 8 to 12 in the morning and from 1 to 4 in the afternoon. Tuition for the winter half-year is 72 marks ($17.14); for the summer quarter, 36 marks ($8.57). There are 9 special classes in which instruction is given by day, viz., the class in modelling, the class in metallurgy, that in decorative painting, the class in color printing, that in enamel painting, the class in etching, that in art embroidery, the class in sketching exercises, and the class in smithwork.

The evening classes are held every week-day evening, either from 5.30 to 7.30 or from 7.30 to 9.30. Ornamental, architectural, and projection drawing, modelling, anatomy, the history of architecture, of ornamentation, and of interior decoration, lettering, and drawing of various objects of industrial art are among the specialties taught.

The collections of the museum are open every week-day (except Monday) from 10 to 3 o'clock in winter, from 9 to 3 in summer, and on Sunday at all seasons from 12 to 3.

The library of the museum is open daily from 10 to 3 and from 6 to 10, except that it is closed, during the months of July and August, in the evening, and from August 16 to 31 in the daytime.

Herr O. Jessen, director of the Artisans' School, has published a prospectus of the school for the summer half-year of 1891, together with "news items concerning the school year 1890–'91." This is a just, as well as modest, designation of the work, for it is far from being a full report.

The Artisans' School aims to give to apprentices and helpers, during their leisure hours, that educational training in general knowledge, in drawing and industrial art (adapted to every calling), which should be added to the workshop practice as an indispensable complement.

Instruction is given in this school in the afternoons and evenings of week-days, and on Sunday forenoons. Pupils are free to choose the subjects of study. The subjects of instruction and practice are free-hand and circle drawing, geometry, special drawing, industrial art form-study, modelling in clay and wax, decorative painting, mathematics, physics, electrotechnics, mechanics, chemistry, arithmetic and book-keeping.

The teaching in this school is specialized to an unusual degree. There are, for example, twenty-five separate courses in drawing, each

adapted to the requirements of a particular trade, as, the course for joiners, the course for turners, that for tinmen, for locksmiths, for watchmakers, for carpenters, for goldsmiths, for engravers, etc.

Besides the regular courses there are special day classes for painters during four winter months, on all week-days. Instruction is begun at 9 o'clock in the morning, and includes exercises in drawing and decorative painting. There is also, in winter, a day class for cabinetmakers, and a special school for mechanics is maintained, with technical teaching, on week-day forenoons.

Forty-four teachers assist Director Jessen in his work. Tuition fees are regulated as follows: For eight or less than eight hours per week, 6 marks ($1.43); for twelve hours per week, 9 marks ($2.14); for sixteen hours or more, 12 marks ($2.86), for the half-year. For the day classes for painters and cabinetmakers the tuition fee is 5 marks ($1.19) per month.

During the winter half-year of 1890–'91 there were in attendance at this school 827 helpers and 1,349 apprentices; in all, 2,176. These pupils represented forty-three trades; 287 were mechanics; 190, masons; 279, painters; 215, joiners; 150, locksmiths. The ages of the pupils ranged from 14 to 30 and upward, 43 being over 30.

SORAU.

The Weaving School at Sorau was organized and opened May 3, 1886. This school aims to educate its pupils to be practical weavers, competent masters, and skilful manufacturers. The instruction is given in a full course of two classes; a half course of two classes; and an evening course.

The full course is intended for those who choose to educate themselves for the independent conduct of a manufacturing business. The short and evening courses are specially adapted to the needs of those who seek principally to perfect themselves in practical weaving.

The plan of instruction is so arranged that it is possible for students of the full course, if well prepared and diligent, as well as for those who do not care to take a thorough course in drawing, to complete the course in one year. The pupil must, as a rule, have reached the highest class in the common school before he can be received into the full course of this school.

Tuition per half-year in the full course, lower department, is 50 marks ($11.90) for Germans; 120 marks ($28.56) for foreigners. In the upper department it is the same. For half-time pupils, in both the lower and higher divisions of the school, the charge per half-year is 25 marks ($5.95). Evening pupils pay 15 marks ($3.57) per half-year.

FRANKFORT ON THE MAIN.

At Frankfort on the Main is a school of industrial art (*Kunstgewerbe-Schule*), of which Prof. Luthmer is the director, and which is under

the supervision of one of the committee of the Industrial Art Union of Central Germany.

This school is divided into two sections—the preparatory school (drawing and modelling), and the *Fachschule*, consisting of five special classes. The design of the preparatory school (*Vorschule*) is to fit young people, such as apprentices, helpers, etc., for the special classes of the *Fachschule*, and, so far as there is room, to give the like facilities to pupils of other establishments. The special classes are intended for such as would acquire a more extensive knowledge of some branch of industrial art, and fit themselves to be master workmen, foremen of manufactories, etc.

The preparatory school has an evening course and a Sunday course; in the former instruction is given on week-day evenings from 7.30 to 9.30; in the Sunday course, from 8 to 11 o'clock a. m. The evening course falls into three divisions—an elementary, middle, and an upper class, each of which requires one year's attendance.

To enter the preparatory school the pupil must be at least 15 years old, and must possess a general education equal, at least, to that obtainable in the *Volksschule*.

In the *Fachschule* classes the time of instruction and practice is from 8 a. m. to 12 m., and from 2 to 6 o'clock p. m. on every week-day, except that on Saturday afternoons there is no school.

The course for workers in wood, metal, clay, porcelain, glass, stone, etc., lasts through two years; in the other classes the course is three years long. These classes are as follows: One for painters on glass, porcelain, decorative painters, etc.; one for modellers of clay and wax; one for goldsmiths, engravers, silversmiths, etc.; and one for wood carvers.

The school year begins in the middle of September and continues till the middle of July. Holidays consist of a week at Christmas time, three weeks at Easter, and eight weeks from the middle of July. Tuition in the evening course of the preparatory school costs 12 marks ($2.86) per year; in the Sunday course, 6 marks ($1.43). In the *Fachschule* it is 75 marks ($17.85) per year. On leaving the school pupils receive certificates specifying the length of time of their attendance, and the degree of knowledge and skill attained by them.

The Industrial Continuation School of the city of Frankfort on the Main was opened April 15, 1890. Its success was immediate; for at the start there were 234 pupils. This number increased during the summer half-year to 585. At the beginning of the winter half-year, October 12, 1890, there were 612 pupils in attendance, and this number grew to 845. These were of various ages, from 12 to 33. The faculty consists of 27 teachers. The foundation of a library has been laid, and the nucleus of a museum formed, with a collection of models of wood work, etc.

The hours of instruction on week days run from 3 to 5, 5 to 7, and 7 to 9 in the evening; on Sundays, from 8 a. m. to 12 m. The tuition fee for journeymen is 6 marks ($1.43). For apprentices and young artisans under 18 years of age, and for school boys, the fee is 3 marks (71 cents) a half-year.

An evening school for working girls was opened at Frankfort on the Main April 29, 1889, under the management of the Housekeeping School Association of that city. At Easter, 1890, a morning course was added for the instruction of such girls as could not be accommodated in the evening school, and such as were not obliged to devote all of their time to wage-earning for self-support, and who oftentimes, at 15 or 16 years of age, were not strong enough to work full time.

In both of the courses girls are taught cooking, ironing, and other details of housekeeping—in the morning from 9 to 12, in the evening from 7 to 9 o'clock—in three class rooms. The same teachers conduct both the evening and the morning classes, except in one instance, where a teacher in the evening school is elsewhere engaged during the day, necessitating the employment of a substitute in one of the morning classes.

By a system of rotation the girls who during one week are taught in the kitchen, for example, pass next to the division where ironing and other forms of handiwork receive attention, while those with whom they exchange places take their turn at cooking and ironing. In this way all branches of housework—sewing, cutting out of garments, household economy, etc.—are taken up in regular order.

The attendance in the evening course during the year was from 25 to 30; in the morning course, 15 to 18.

The work of the association received recognition by the government during the year, the Prussian minister of trade and industry having granted to the society a subsidy of 1,000 marks ($238) to aid its objects. The city authorities also gave assistance and encouragement to extend the society's undertaking. The Polytechnic Association also contributed liberally in aid of the movement. The association is yet but two years old, and the limit of its growth has not been reached.

COLOGNE.

The statistics of the industrial educational establishment (*Gewerblichen Lehranstalten*) of the city of Cologne for the winter semester 1890–'91 are concisely given by the director, Friedrich Romberg, in a general review, published in quarto sheets in January 1891.

The organization includes a special trade school (*Gewerbliche Fachschule*) with 43 teachers and 493 pupils; a special continuation school (*Fortbildungsschule*) for journeymen with 13 teachers and 232 pupils; and a general continuation school (*Allgemeine Fortbildungsschule*) for apprentices with 52 teachers and 797 pupils. Of the pupils in the

special trade school 282 were over 18 years of age, and 211 under; in the journeymen's school 189 were over 18, and 43 under; in the apprentices' school 26 were over 18, and 771 under.

The plan of instruction in the various departments of the institution under Herr Romberg's management is much the same as in other German schools of this class, and it needs no detailed description.

Among the means of education made use of in this establishment are excursions (undertaken in summer, and personally conducted by some of the special teachers); the museum of industrial art (which, by the courtesy of Herr Pabst, the director, is open to students free of charge); the library of the Traders' Union (added, in 1889, to the library of the special trade school, and now affording to both teachers and pupils of the institution a very rich collection of technical works for circulation and reference); lectures on technical subjects (to which students are admitted on complimentary tickets).

In the autumn of 1879 the machinists' school came into being as a department of the special trade school above described. At the opening of the winter half-year of 1890–'91 it became a separate establishment. It has the same director, however, as before—Herr Romberg.

The machinists' school includes a higher department—the technical intermediate school, and a lower—the master workmen's school. The technical intermediate school (*Die Technische Mittelschule*) has a preparatory course and two special courses of instruction, each lasting one year.

The master workmen's school has three courses of study, each of five months' duration. The winter session begins on the 1st day of November and continues till the end of March; the summer semester begins on the 1st day of May and lasts until the end of September. Admission to either of these schools is by examination. The tuition fee for each course (semester) is 75 marks ($17.85).

In the preparatory classes are taught German, arithmetic, geography, geometrical drawing, and technical free-hand drawing, etc.; in the higher classes, mathematics, mechanics, physics, chemistry, geometry, machine construction, theory of steam and hydraulic motors, electrotechnics, etc.

One division of the *Fachschule* is a school of industrial art (*Kunstgewerbeschule*). It was organized in the year 1879. The establishment includes a school of decorative painting, a school of cabinetmaking, a school of ornamentation and modelling, and a school of metal work.

This department, also, is under the control of the same director—Herr Romberg. The terms of instruction begin and end on the same days with those of the master workmen's school before reported. The tuition fee is the same in amount—75 marks ($17.85) for each course.

There are no statistics available respecting these several departments except such as we have cited. The master workmen's school—

the most recently established of the branch schools—is organized on a generous plan, and its object is intensely practical. It is yet too young to have a history, however.

DUSSELDORF.

The School of Industrial Art is an institution founded by the city. It receives a subvention from the state, and is under the supervision of the state and the local authority. The object of this school is to afford young artisans an opportunity to acquire such knowledge and skill as will be of service to them in their several callings.

There are three departments: A preparatory school (*Vorschule*); a *Fachschule*, for wood carving, engraving, modelling, etc.; and an evening school for drawing and modelling. In the first and second departments instruction is given in the daytime to those who can devote their entire time to it.

The course in the preparatory school lasts one year. The hours of study are from 8 a. m. to 12 m., and from 2 to 6 p. m., with a half holiday on Saturday afternoon. For admission to this department pupils must possess a good common school education, must be at least 14 years old, and must have chosen some practical calling.

As the requirement for admission to the *Fachschule* the pupil must have completed the course of study in the preparatory department, or stand a satisfactory examination. Guests, that is, such as take only a partial course, can be received into the *Fachschule*, if actual workmen, not otherwise. Pupils are admitted twice in the year, April 1 and October 1, by the director, and only in exceptional circumstances will any be received in the intervals between those dates.

The tuition fee in the preparatory and *Fach* departments for the summer session is 25 marks ($5.95); for the winter session it is 35 marks ($8.33). In the evening classes for the summer session the fee is 10 marks ($2.38), in winter the same. Guests must pay in summer 15 marks ($3.57), in winter 20 marks ($4.76).

ESSEN.

At the Krupp steel works in Essen several schools are maintained by the famous firm for the benefit of their workmen. They maintain four primary schools as well as a private school for boys and girls. Since 1875 they have also established two industrial schools, where the wives and daughters of laborers who are often surprisingly inexperienced in housework are instructed in the theory and art of domestic economy.

The continuation schools of Essen were founded by Krupp, and are well attended. The firm have received large reflex benefits from their well directed enterprise and philanthropy. Many expert craftsmen, laborers in special departments, and master workmen have been trained in the Krupp schools; and their acquired skill is equivalent to so much additional capital of a firm whose art is their best inheritance.

Much greater still is the advantage which education brings to the pupils themselves. They are thoroughly instructed in their trade, and become accustomed to exact work. The continuation schools—attendance upon which is obligatory—afford them the opportunity to gain further theoretical knowledge of their calling, and to learn the art of drawing besides.

HANAU.

The Royal Designing Academy was founded in the year 1772, and since 1889 has become a *Fachschule* for artistic gold work. It gives female pupils an opportunity, however, to learn embroidery, painting, and the technics of industrial art. No pupil is admitted under the age of 13. Instruction is given to boys and girls in 20 different rooms.

The yearly tuition fee for foreigners (other than German pupils) is 200 marks ($47.60); for day pupils, 50 marks ($11.90); workshop pupils, 50 marks ($11.90); one-hour pupils, 36 marks ($8.57); half-pay pupils, 18 marks ($4.28); brothers of regular pupils, 9 marks ($2.14); free pupils, 2 marks (48 cents).

Instruction is given in drawing and modelling classes in winter from 9 a. m. to 12 m., and from 2 to 4 p. m.; in summer from 8 a. m. to 12 m., and from 2 to 5 p. m.; evenings from 6 to 8 o'clock, and from 8 to 10.

The whole number of male pupils in the Hanau academy during the year 1890–'91 was 430, of whom 67 were full-day pupils, taking 47 hours' instruction per week; 362 took only 16 hours per week. The number of female pupils was 60, of whom 8 were day scholars, receiving 23 hours' weekly instruction; and 52 were girls, taking but 16 hours per week. The study period in this school lasts 40½ weeks per year.

Prof. M. Wiese is director of the academy, and under him are [illegible] teachers in the varied specialties of the establishment. The majority of the pupils, classified according to trades, were trinket makers, 17[illegible] jewellers, 32; silversmiths, 30; engravers, 34, etc. Pupils' ages range from 13 to 45.

INDUSTRIAL TRADE SCHOOLS AND CONTINUATION SCHOOLS IN SAXONY, HAMBURG, AND BREMEN.

Between the years 1837 and 1840 five royal labor schools were [illegible]tablished by the state, namely, at Chemnitz, Dresden, Leipsic, Plau[illegible] and Zittau.

The following statistics are given concerning these five schools [illegible] the year ending December 2, 1889:

Location.	Date of opening.	Teachers.	Pupils.	Received from tuition fees.	State aid.	Expe[illegible]ses.
Chemnitz	Oct. 1, 1837	.....	132	.....	.....	.....
Dresden	Oct. 1, 1837	11	98	$603.71	$5,356.43	$5,[illegible]62.28
Leipsic	Oct. 1, 1838	12	176	1,163.82	5,582.77	6,748.97
Plauen	Nov. 2, 1840	8	109	766.36	4,497.96	5,325.73
Zittau	Nov. 1, 1840	9	88	556.92	3,806.10	4,363.73

Free-hand and architectural drawing, with perspective and projections, and the construction of articles are given special attention in every course. Of the 154 hours of instruction (constituting a course) 97 are devoted to drawing.

The tuition fee is 30 marks ($7.14) per half-year, which amount, according to the report, covers only 12 or 14 per cent. of the whole expense account current of these schools. The remaining cost is paid by the state.

Among the other special schools of industry in Saxony are included 29 weaving, embroidery, and lace making schools. Of this number five are day schools, concerning which the following facts may be of interest:

Location.	Kind of school.	Year of opening.	Means of support.	Income from fees, 1888-'89.	Expenditures, 1888-'89.	Teachers.	Pupils, 1889.
Chemnitz	Higher weaving	1857	Commune	$3,339.14	$3,960.32	4	62
Grosschönau	Weaving	1866	Association	319.40	1,736.21	3	34
Seifhennersdorf	Weaving	1881	Association	130.90	1,239.50	4	49
Werdau	Weaving	1835	Commune	898.45	1,552.47	3	22
Limbach	Embroidery	1861	Endowment	1,259.02	2,682.97	4	33

All of these schools are equipped with hand and power looms for instruction and practice. The Chemnitz school has 43 hand looms and 15 power looms; the Grossschönau school, 30 hand and 6 power looms; the Seifhennersdorf school, 27 hand looms and 1 power loom; the Werdau school, 7 hand and 7 power looms; and the Limbach school, 66 embroidery and knitting machines and 9 sewing machines.

The cost of tuition per annum at these schools is as follows: At Chemnitz, for Germans, 270 marks ($64.26), and for foreigners, 450 marks ($107.10); at Grossschönau, for natives of Saxony, 60 marks ($14.28), and for others, 150 marks ($35.70); at Seifhennersdorf, for natives of the town, free, for inhabitants of Saxony, 50 marks ($11.90), and for others, 75 marks ($17.85); at Werdau, 150 to 75 marks ($35.70 to $17.85), and for evening pupils, 18 to 6 marks ($4.28 to $1.43); at Limbach, for inhabitants of Saxony, 180 marks ($42.84), for other Germans, 300 marks ($71.40), and for foreigners, 600 marks ($142.80).

In addition to these 24 evening schools for weaving, embroidery, etc., are reported to exist in the kingdom of Saxony. Altogether these 29 schools employed, in 1889, 163 teachers; had a total of 2,072 pupils; an income from entrance fees and tuition of 32,562 marks ($7,749.76), and an expense account of 117,600 marks ($27,988.80).

There are other industrial *Fach* schools of Saxony, with various names, which can not be assigned to any category. There are 36 of them, with a total membership (December 2, 1889) of 2,553 pupils. The number of teachers was 138.

The amount of fees paid by students was 46,152 marks ($10,984.18); the total expenditures for the year in the 36 schools came to 152,916 marks ($36,394.01); many of these schools are small, and derive their income from guilds, unions, or individual patronage for the most part,

ough some are supported by the communes, and one, the toy school Grünhainichen, by the state.

There is still another class of special schools in Saxony which reserves mention—the royal schools for sailors—of which there are six. These are state institutions, and were established in deference to the demands of ship owners for an improved preliminary training for seamanship and pilotage on the vessels and rafts navigating the river Elbe. Instruction is limited to a session of three or four months in winter, when the rivers are closed to navigation. The tuition fee is only 3 marks (71 cents) for each pupil. During the winter of 1888–'89 the state appropriated 2,255 marks ($536.69) for these schools. The number of pupils for each school for the year was, in the 6 schools, respectively, as follows:

Location.	Year opened.	Pupils.
Schandau	1855	30
Königstein	1855	11
Wehlen	1855	14
Pirna	1856	14
Meissen	1881	7
Riesa	1882	16

Since the year 1874 courses of instruction for engineers of locomotives and machinists have been conducted in various industrial centres of Saxony, under the management of the Engineers and Architects' Union. The object of these courses is "to ensure safety, skill, facility, and economy" in the control of the steam engine.

Instruction is given by lectures, delivered for the most part by the industrial inspectors or their assistants. These lectures treat of the properties of steam, the construction of the steam boiler, firing, and security against explosions, the steam engine and its care. A course consists of ten to fifteen lectures of two hours each as a rule. Each pupil pays a fee of 3, 5, or 6 marks (71 cents, $1.19, or $1.43) per course.

Courses of instruction of this kind were held during the year at several places in the following industrial inspection districts:

In the Dresden district, since 1878, 13 courses have been held: at Dresden, 2 at Freiberg, and 1 at each of the towns of Potschappel, Meissen, Pirna, and Düben. In these 19 courses there were 1,328 pupils. In the Chemnitz district a similar school course was instituted in 1868 by the Artisans' Union. The course here is of six months' duration; and, in 1889, 63 pupils were in attendance. In the Zwickau district courses of a like kind are carried on. In the Leipsic district there are two schools of this sort—one of which has been merged in the industrial Sunday school of the Polytechnic Society. This is in operation from October to June, and in 1889 it had 56 pupils.

Another school was organized in 1887. The course lasts from October to March, as an evening school. In the winter 1889–'90, 32 pupils

attended it. In the districts of Bautzen, Meissen, and Plauen similar courses are held.

Saxony has also eleven special industrial institutions for the all-round education of women and girls in female employments, lace making, etc. These schools are, in brief—the Industrial School at Annaberg, opened in 1885, with 4 teachers and 65 pupils; the Continuation School of the Artisans' Union at Chemnitz, opened in 1864, with 4 teachers and 77 pupils; the Women's Industrial Union at Dresden, opened in 1871, with 20 teachers and 318 pupils; the Women's Educational Union at Dresden, opened in 1870, with 18 teachers and 207 pupils; the Women's Industrial and Daughters' Educational Institute at Dresden, opened in 1879, with 5 teachers and 57 pupils; the Higher *Fachschule* at Leipsic, opened in 1875, with 12 teachers and 196 pupils; the Adult Daughters' School at Leipsic, opened in 1863, with 6 teachers and 54 pupils; the Female Institute of Drawing at Leipsic, opened in 1879, with 3 teachers and 30 pupils; the Women's Industrial School at Plauen, opened in 1877, with 4 teachers and 21 pupils; the Royal Lace Making School at Schneeberg, opened in 1878, with 1 teacher and 13 pupils; and the Women's School at Schwarzenberg, opened in 1884, with 4 teachers and 43 pupils.

Saxony has eight agricultural schools of a grade below the Leipsic Institute and the Agricultural School at Döbeln, and one school of gardening, all of which except the last mentioned are supported in the main by circles of the Agricultural Union. The School of Gardening at Dresden was organized by the Gardening Society, Flora, in 1874. These schools yield the following statistics up to December 2, 1890:

Name of school.	Location.	Year of opening.	Teachers.	Pupils.
Agricultural winter school	Annaberg	1882	10	19
Agricultural winter school	Auerbach	1876	8	31
Agricultural fruit and gardening school	Bautzen	1875	11	134
Agricultural school	Chemnitz	1877	7	59
Agricultural winter school	Freiberg	1877	10	37
Agricultural school	Meissen	1879	7	82
Agricultural winter school	Rochlitz	1877	14	58
Agricultural circle school	Wurzen	1878	6	52
Gardening school	Dresden	1875	3	55

Of the 32 trade schools (*Handelsschulen*) reported in Saxony four are public schools for apprentices and are connected with higher departments. These four schools are all supported by associations of merchants or manufacturers. The following short table shows some of the more important facts in regard to them:

Location.	Year of opening.	Teachers.	Pupils.	Tuition per annum.	Income from tuition, 1888-'89.	Expenditures, 1888-'89.
Bautzen	1856	5	122	$19.04-$35.70	$2,724.62	$4,020.30
Chemnitz	1848	12	269	17.14- 57.12	9,566.89	11,599.41
Dresden	1854	23	588	19.99- 85.68	21,468.31	20,640.07
Leipsic	1831	27	595	14.28- 85.68	16,751.39	19,380.82

The remaining schools of this class are not in connection with higher departments, but are maintained almost without exception by mercantile corporations. Many of the schools are small, but they are all included in this tabulation as an index of the extent to which Saxony is permeated by the system.

The following trade schools of Saxony have no organic relation with other educational establishments:

Location.	Year of opening.	Teachers.	Pupils Dec. 2, 1889.
Annaberg	1887	2	115
Auerbach	1881	3	39
Bischofswerda	1885	2	30
Crimmitzschau	1887	4	62
Dippoldiswalde	1889	3	19
Döbeln	1864	4	59
Frankenberg	1859	6	47
Freiberg	1859	3	127
Grimma	1855	4	23
Grossenhain	1870	3	44
Hainichen	1887	5	21
Kamenz	1857	4	23
Leipsic	1852	6	93
Leisnig	1845	2	20
Meissen	1869	3	64
Oschatz	1850	1	30
Pirna	1859	6	65
Plauen	1858	8	233
Radeberg	1888	4	18
Riesa	1877	5	29
Rochlitz	1885	4	17
Rosswein	1889	2	24
Schneeberg	1876	3	[illegible]
Werdau	1888	8	[illegible]
Zittau	1876	6	[illegible]
Zwickau	1847	3	[illegible]

There are two trade schools conducted by private persons which should be mentioned in the category of educational establishments in Saxony. Both schools are in Leipsic. They together employ 13 teachers and furnish instruction to about 300 pupils.

The 32 trade schools mentioned employ 184 teachers and in 1889 had 3,364 pupils in attendance. The amount of tuition fees (1888–'89) was 319,306 marks ($75,994.83) and the expenses were 363,686 marks ($86,557.27). An analysis of the statistics concerning the above schools shows that 28 of these trade schools are controlled by mercantile societies; 2, by private persons; 1, by the commune; and 1, by the chamber of commerce. Pupils must be 14 years old to enter any of these schools. The instruction courses last three years in most cases; but in four instances two years only.

The plaiting and braiding of straw are such important industries in some parts of Saxony that children are taught them in four special schools. In the winter of 1889–'90, 240 children under 14 years of age received instruction in these branches. Six female teachers carried on this work under the supervision of four directors who were specialists in the art (*Fachmännern*). Pupils are received at from 5 to 7 years of age—at Dippoldiswalde, at the age of 4 years. The duration of instruction is unlimited. There is no Sunday teaching. There is no charge for tuition: but the children receive a small wage for good work.

The entire expense of these schools was 2,798 marks ($665.92). Of this sum 915 marks ($217.77) went to the female teachers and 1,200 marks ($285.60) for material. The cost is mostly covered by state aid, (to the extent of 2,100 marks or $499.80). Rent, heating, lighting, and cleaning of the school rooms are provided for by the communes.

In that portion of the kingdom known as Swiss Saxony are several schools of household industry, founded by the enterprise of Herr Clauson-Kaas, and supported by subventions from the state and communes.

These schools are two carving schools for boys, at Pirna and Hohenstein; five basket plaiting schools for women and children—one at each of the five points, Pirna, Wehlen, Schandau, Hohenstein, and Hinterhermsdorf; one school of cane making for men and boys at Hohenstein; two schools of artificial flower making for women and girls at Hohenstein and Schandau; one straw braiding school for children at Hohenstein.

The teaching staff for these schools consists of 2 head teachers and 7 assistants, 9 in all. On December 2, 1889, there were 190 pupils attending, 64 adults and 126 children. Of the 190 pupils 25 belonged to the carving school at Pirna; 85 to the basket and toy schools, and other similar schools at the five places named; 80 to the schools of artificial flower manufacture. No fees are payable for tuition.

Boys of ten years of age and young men and adults are admitted to the carving and cane making schools; children of both sexes at ten years of age, and women and girls may enter the schools of basket making; women and girls (at ten years of age) may be admitted to the schools of flower making, while only children of the earliest school age may attend the schools of straw braiding.

DRESDEN.

The Royal Academy of Arts (*Die Königliche Academie der Bildenden Künste*) was originally endowed as an academy of painting in 1705, but in 1764 it was expanded into an academy of art. This is a state institution, and provides instruction in drawing, painting, sculpture, copper engraving, wood carving, and architecture.

During the year 1888–'89, in this establishment, 21 teachers imparted instruction to 131 pupils. Of these pupils 91 were from Saxony, 37 from other German states, and 3 from foreign countries.

An entrance fee of 20 marks ($4.76) is paid by the pupil on admission to the academy. During the year, however, 22 students were exempted from the payment of tuition fees.

State travelling scholarship stipends of 2,400 marks ($571.20) annually are provided for 2 artists; 3 scholarships for painters, each worth 980 marks ($233.24) per annum; 3 scholarships for pupils of the academy classes of 200, 250, and 300 marks ($47.60, $59.50, and $71.40), respectively, per annum, and 2 of 135 marks ($32.13) each. These travelling scholarships are much sought after and highly appreciated, since

their holders have access to all other museums and academies o free of charge.

The public exhibition of the works of pupils of the Dresden aca in 1889 consisted of 450 numbers. The library contained 4,094 volu The tuition fees aggregated about 5,000 marks ($1,190). The expenses amounted to about 100,000 marks ($23,800), of which sum state contributed 95,000 marks ($22,610).

The Royal School of Industrial Art (*Die Königliche Kunstgew chule mit Kunstgewerbemuseum*) became a state establishment in Prior to that date it had been connected with the Polytechnic I tute. Besides the director this school has 21 teachers, and on D ber 2, 1889, 289 pupils belonged to its classes. Two hundred an of these were from Saxony, 74 from other German states, and 13 foreign countries.

In the day department of this academy there are special sc of architecture, of ornamental modelling, figure modelling, sculp decorative painting, pattern designing, porcelain painting, lithog and color printing, general and theatrical decoration; in the ev division, classes are instructed in architecture, modelling, figur free-hand drawing.

Since its opening there have been educated at this school persons, of which number 874 were members of the day classes a of the evening classes.

The day pupils have made choice of the following occupations: I trial architecture, etc., 100; painting, lithography, and color pri 369; pattern designing, 178; sculpture and carving, 173; drawi

In the evening school the pupils choosing modelling, wood and carving, etc., numbered 28; cabinet making, goldsmith work, et engraving and sculpture, 17; decorative painting, pattern drawing 41; other industries, 9; without occupation, 2.

The school library contained, December 2, 1889, 4,538 works, about 7,200 volumes. In connection with the library is a collect materials and manufactured articles of industrial art, numbering objects, as well as a collection of ornamental works, with 17,523 cuts and copperplate sheets illustrative of earlier periods of art.

The Royal Museum of Industrial Art stands in close relatio this school. It contains 22,300 specimens of objects of industrial its collection, representing the various branches of industry kingdom—especially the textile industry, ceramics, architectural pations, and decorative painting. During the year 1888–'89, 7,60 sons visited the museum.

German pupils in the day classes pay 30 marks ($7.14) per ha for tuition; foreigners, 45 marks ($10.71). For evening instructio month, four hours a week, 1 mark (24 cents); for five to eight per week, 1 mark 50 pfennigs (36 cents); for nine to twelve hou

week, 2 marks (48 cents). The tuition fees for the year 1888 came to 7,780 marks ($1,851.64).

The total expense of the school and of the museum amounted to about 133,000 marks ($31,654); of this sum the state gave 124,300 marks ($29,583.40).

The preparatory school of the Royal School of Industrial Art (*Die Vorschule der Königlichen Kunstgewerbeschule*) is of a grade intermediate between the common school and the special courses of the school of industrial art. Formerly this preparatory school was in immediate connection with the school of industrial art, but the increasing numbers of the pupils made a separation necessary. This was effected on October 1, 1886, when it became an independent institution. Only such pupils will be received into special classes of the industrial art school as have been able to pass an examination for promotion in the preparatory school. In 1889 the school employed 8 teachers for the instruction of 53 pupils. It is supported mainly by the state. Out of a total expenditure of 17,570 marks ($4,181.66), 15,730 marks ($3,743.74) was from state aid.

At Dresden there are 8 municipal continuation schools, for boys only, with a total attendance of 1,770 pupils. Seventy-nine teachers are employed. Besides, there are 5 continuation schools for boys in the city, which are sustained by associations. Forty-nine teachers are required in these schools, and the number of pupils is 1,282. A private continuation school also flourishes in this city, having 6 teachers and an attendance of 252 pupils. There are also 12 schools classed as technical schools, with continuation schools annexed. One hundred and twenty-eight teachers give instruction to 2,799 pupils, all boys.

Finally, 10 special technical schools are in operation in the city. These are mixed schools, with an aggregate attendance of 1,208—344 boys, 864 girls. One hundred and fifty-nine teachers are employed. All of these are *Fach* schools, as the Special School of the Painters' Guild, etc.

CHEMNITZ.

At Chemnitz there are the following technical institutes, all under one roof and mainly supported by the state: A higher industrial school founded in 1836, with departments for technical mechanics, technical chemistry, and, since 1878, for building; a labor school, founded in 1837; a school for master workmen, founded in 1855, which originally educated only mechanics (machinists, spinners, weavers, etc.), but which, since 1869, has had divisions for dyers and bleachers, since 1880, for millers, and since 1885, for soap making; a school of industrial drawing, founded in 1796. These schools together employ 43 teachers.

The conditions of admission to these schools are: For the higher industrial school the pupil must be at least 15 years old, and must have the travelling certificate of a real-school or its equivalent; for the labor

school the requisites are 15 years of age, the completion of a common school course, and practical experience of at least 2 half-years in some manual trade; for the school for master workmen the same as for the labor school and at least 2 years' practice in some business; for the school of industrial drawing the pupil must be 14 years of age, must have received confirmation, and have reached the grade of the common school.

The teaching in the several schools lasts as follows: In the industrial school, division of mechanics and chemistry, three and one-half years, in the building department, three years; in the labor school, four winter half-years; in the school for master workmen, one and one-half years, in three half-year courses; in the school of industrial drawing an unlimited time.

The tuition fees, per half-year, in the different schools are—for the industrial school, 60 marks ($14.28) for Germans, and 120 marks ($28.56) for foreigners; for the labor school, 30 marks ($7.14); for the master workmen's school, 30 marks ($7.14); and for the school of industrial drawing, 3 marks (71 cents) for each branch.

Since the opening of this establishment there have been—in the higher industrial department, 4,000 pupils; in the labor school, 1,650 pupils; in the master workmen's school, 3,000 pupils; and in the industrial drawing school, 3,000 pupils; a total of 11,650 pupils.

The number of pupils attending the several departments of the Chemnitz Technical School on December 2, 1889, was as follows:

Mechanical department	1
Chemical department	-
Building department	-
Labor school	1
Master workmen's school	2
Dyers' school	
Millers' school	:
Soap makers' school	
Industrial drawing school	12
Total	77

Of these 498 were natives of Saxony; 230 of other German states; while only 49 were foreigners. The expenditures for the year were 195,200 marks ($46,457.60). Of this amount about 42,500 marks ($10,115) came from tuition fees, and 148,000 marks ($35,224) from the state.

LEIPSIC.

From the historical sketch which accompanies the report of the Royal Academy of Art, and of the Art Trade School, at Leipsic, by the director, Prof. Nieper, Ph. D., we learn that this institution was founded under royal patronage in 1764. For one hundred and twenty-

eight years, therefore, the academy has been dedicated to the object for which it avowedly exists, viz., "The cultivation of the graphic art, and of art in its applications to industry."

The specialties taught in this institution are three, viz., architecture, sculpture, drawing and painting. The technical instruction is supplemented by lectures on such subjects as industrial art, human anatomy, physics, chemistry, photography, etc.

In the year 1889–'90 there were 208 pupils in attendance at the academy. Since 1871, 1,732 students have belonged to the different classes. The occupations chosen by these students have been as follows: Decorative painters, 394; sculptors, modellers, etc., 161; lithographers, 525; xylographers, 272; engravers, 94; architects, 46; the remainder going into various other pursuits. Of this entire number (1,732) only 69 were foreign born; and so it appears that the prophet of art is not without honor in his own country.

The volume from which this brief account of the Royal Academy of Art has been abstracted is itself a work of art. It is embellished with forty-five illustrations which represent the skill attained by students of the academy in the arts of lithography, wood engraving, etc.

The City Trade School was founded in 1875. Pupils are admitted to the day courses who have reached the second class of the *Volksschule.* Only such as have attended the day school one year can enter upon the first course of the evening school, and only after one full year's attendance therein can they begin the second course of the evening school.

The course of instruction in the day classes, as in each of the evening courses, lasts one year. The day course is in session 38 hours per week, and, with the 4 hours' instruction in modelling (on Wednesday and Saturday afternoons from 2 to 4 o'clock), 42 hours in all. The evening course occupies 12 hours per week.

In the day school the subjects taught are building construction, architectural, geometrical, and projection drawing, German, arithmetic, geometry, physics, chemistry, geography, history, modelling, and free-hand drawing. The evening course embraces the study of German, history, arithmetic, geometry, free-hand and projection drawing, machinery, trade principles (*Gewerbekunde*), commercial bookkeeping, technical nature-knowledge, elements of building, and modelling.

The attendance during the first year (1875–'76), in the day course, was 48; in 1889–'90, it was 211. In the evening course, during the first year, the attendance was 70; in 1889–'90, it was 591. In all, during 1875–'76, 118; in 1889–'90, 802.

As an adjunct to this school there was established by the city council of Leipsic, in 1886, a *Fachkurs* for printers, that is, a special course in the printing art. None can take this course except apprentices whose employers are members of the Leipsic Printers' Union. The course lasts

three years, and instruction is given in the evening from 6 to 8 o'clock, aggregating eight hours per week. At Easter, in the year 1889, the attendance was 185.

The instruction is of the most practical character, including not only the technical and mechanical parts of the trade, but embracing, also, German, Latin, grammar, the preparation of manuscript for the press, proof-reading, punctuation, etc., all of which are of immediate use to compositors and printers.

A special course for painters was organized in 1886 as a department of this institution. The course extends through three consecutive half-yearly winter sessions (ending with Easter), and includes three months' practice in decorative painting during the months of November, December, and January, throughout the entire three years. One hundred and thirty-nine pupils attended this course in 1889–'90.

A special school for tailors was founded at Easter in 1887, in connection with the Leipsic Trade School. Apprentices of members of the Tailors' Guild only are allowed to enter this school.

A three years' course of instruction is given in the evenings from 7 to 9 o'clock, eight hours per week in all. The instruction is both general and special. Geometry, drawing, trigonometry, etc., constitute the general studies; while the technical side of the course consists of drawing—first, the minor parts of garments, the pockets, etc., for example, and afterwards other objects. The number of pupils in attendance on this instruction in 1889–'90 was 36.

Prof. Nieper is director of all departments of this trade school, as well as of the Leipsic Academy of Art to which allusion has been already made.

Tuition fees in the day school course amount to 40 marks ($9.52) per year; in the evening school, 20 marks ($4.76).

Since the establishment of the trade school in 1875, 2,897 pupils have belonged to it. These pupils are grouped together in three principal classes, as follows: Architecture and mechanics; painting and graphic trades; plastic arts. In detail—58 have become architects; 339, masons; 130, carpenters; 163, machinists; 107, mechanics; 52, draughtsmen; 118, locksmiths; 85, cabinetmakers; 301, painters on glass and porcelain; 105, engravers; 246, lithographers; 121, wood engravers; and a smaller number were scattered through various trades, such as photography, bookbinding, tailoring, etc.

GOTHA.

The Royal Building School, etc. (*Die Herzogliche Sächsische Baugewerbeschule und Handwerkerschule*) is a state institution, and is maintained by the state ministerial office of Saxony. Its object is to train young artisans to become master builders, to fit them for positions as railroad or municipal foremen, etc. Connected with it is a laborers' *school*, where instruction is given in the evenings and on Sundays.

In the winter half-year, 1890-'91, 106 pupils attended this building school, and 182 the school for laborers. During the summer half-year of 1891, 216 pupils attended the laborers' school.

Instruction in the building school is given for fifty hours a week, during four half-years or semesters, each consisting of from nineteen to twenty weeks. In the building school, however, instruction is given only during the winter half-year; in the laborers' school it continues during both the winter and the summer half-years.

Tuition for the winter half-year costs pupils from Saxe-Coburg-Gotha 75 marks ($17.85); others, 90 marks ($21.42). In the laborers' school the tuition fee per half-year is 10 marks ($2.38).

Pupils may be admitted to the lowest class in the building school on proof of possessing a good common school education, and of having had at least six months' experience in a workshop or at the building trade. They must also be at least 16 years old.

The plan of study in both departments of this school is well grounded in mathematics, physics, the principles of building construction, strength of materials, etc.

HAMBURG.

The Trade School System of Hamburg is the title of a work by Carl Melchior of Bonn (prepared for the benefit of the state seminary in the latter city), published in 1891, in which the author gives a comprehensive history of the origin and development of trade education in Hamburg.

The year 1765, he says, was the birth year of trade instruction in Hamburg. It was in that year that Sonnin, Büsch, Sieveking, and others founded the Patriotic Society which afterwards assumed the name of, Hamburg Association for the Promotion of the Arts and Trades. Classes were opened, and the new enterprise slowly but surely won public confidence and appreciation.

The outcome of the movement then begun may be seen today in the General Trade School of Hamburg, and its several offshoots, all of them springing from the germ planted in the eighteenth century. There are three divisions of this school. The common trade school is preparatory in its scope, with classes in free-hand drawing, continuation, and special studies. The day school course embraces instruction in drawing (mainly technical), decorative painting, machine designing, etc., and is designed to fit master workmen for their special duties. The day school consists of two classes—an under and an upper class; the monthly tuition costing 6 marks ($1.43) in the first class, and 12 marks ($2.86) in the last. The school for artisans, which is a department of this institution, was opened in 1865.

The statistical summary of attendance in the three divisions of this school since 1865 indicates a steady, if not a rapid, growth. During the winter half-year in 1865-'66 the total number of pupils in all depart-

ments was 428. Ten years later it was 1,655. At the close of the next decade it was 2,849. In the winter of 1890–'91 the number had increased to 4,406. For this number of pupils a strong teaching staff is requisite, and there are nine ordinary teachers connected with the school, and more than a hundred additional instructors are employed in the special departments.

The German, French, and English languages, writing, bookkeeping, arithmetic and higher mathematics, optics, mechanics, electricity and magnetism, chemistry, free-hand drawing, etc., are the general studies of the evening school; while special courses in drawing are given, adapted to the needs of artisans, carpenters, tailors, locksmiths, carriage builders, ship builders, opticians, watchmakers, gardeners, lithographers, modellers in clay and wax, etc.

In 1881–'82 provision was made for a girls' trade school under the same general management. In 1889 the attendance was 481 pupils.

BREMEN.

At the Industrial Museum special instruction is given in industrial art, both by means of lectures and by practical exercises in drawing, sketching, painting, modelling in wax and clay, etc. The fee for instruction, payable in advance, is 30 marks ($7.14) for each half-year.

Except on Sundays and holidays the museum is open to students all the year round in the daytime.

Here is a permanent exhibition of collections of art and industrial products, at all times accessible to the student, consisting of works of plastic art, ornaments, models, etc., sketches, paintings, wall, window, and door decorations, all kinds of artistic wood work, metal work, paper, leather, and textile goods, stone, glass, and ceramics, together with numerous specimens of other sorts, all duly arranged and classified.

INDUSTRIAL TRADE SCHOOLS AND CONTINUATION SCHOOLS IN BAVARIA.

MUNICH.

The Royal Technical School (*Königlichen Industrieschule*), of which Prof. Kleinfeller is the director, has a teaching staff of 18 members. In this school there are four special courses, each of two years' duration, as follows: A course in technical mechanics; a course in technical chemistry; a course in building construction; a commercial course.

The following table will show the distribution of time in the various courses:

COURSE OF STUDY IN THE ROYAL TECHNICAL SCHOOL, MUNICH.

Subject.	Hours per week.							
	Mechanical course.		Chemical course.		Building course.		Commercial course.	
	First year.	Second year.	First year.	Second year.	First year.	Second year.	First year.	Second year.
Architecture						17		
Bookkeeping							4	4
Chemical laboratory practice				14				
Chemistry			5					
Commerce							3	3
Commercial arithmetic and algebra							2	2
Differential and integral calculus		3				3		
Elements of building construction					6			
English	3	3	3	3	3	3	6	5
French	2	2	2	2	2	2	6	5
Geography							2	2
Geometry	5				5			
German	2	2	2	2	2	2	2	3
History							2	3
Machine construction	10	11						
Mathematics	7		5		7			
Mechanics						2		
Mechanical technology		2						
Mensuration		2				2		
Mineralogical practice				2				
Mineralogy			2		2			
Modelling					4			
Ornamental drawing					4	4		
Penmanship							2	
Physics	4	4	4	4	4	4		
Practical exercises	6	6	12					
Practical physics				2				
Technical chemistry				4			3	
Technical mechanics		2						
Theory of machinery	2	2	2	2				
Total	41	39	37	35	39	39	32	27

There are optional courses, also, comprising instruction in special chemical technology, Italian, etc., adapted to the requirements of the particular specialty which a student is pursuing.

For the school year 1890–'91 there were 86 students in the first year classes of this school. Of this number 22 took the course in building construction, 13 the chemistry course, 40 the course in mechanics, and 11 the commercial course.

The number of students in the classes of the second year's course during the same period was 36. Of these 16 were in the building construction class, 15 in the mechanical, 4 in the commercial, and 1 in the chemical course.

There were also 9 pupils who took partial courses, and 31 who devoted themselves wholly to workshop or laboratory practice. Several of this class were engaged in business as druggists, mechanics, locksmiths, and the like.

Connected with the Royal Technical School is a public continuation school (*Fortbildungsschule*) for builders. Its object is to instruct intelligent master builders, and give them the necessary knowledge and skill which they can not acquire at all, or only imperfectly, in the workshop. The school undertakes to train its pupils to a full under-

standing of the plan and construction of country as well as city dwellings, to follow the details of working drawings, etc.

The school sessions are held in the winter months, from November to March inclusive, and thus do not interfere with the work of the pupils during the busy season.

The plan of instruction requires four years' study. It is very thorough, and equally as well adapted as that of the technical school to the end in view. Fifty-four hours a week are devoted to studies and practical work. Theoretical and practical instruction as to the various systems and means of extinguishing fires is imparted to all students throughout the whole course; and they are carefully drilled in the use of the hose, the hydrant, the ladder, and life-saving apparatus.

The number of instructors in this school is 18. The number of pupils during the winter session of 1890–'91 was 161, of whom 65 belonged to the class of the first year, 45 to the class of the second year, 31 to the class of the third year, and 20 to the class of the fourth year.

The matriculation fee is 4 marks (95 cents), and each pupil pays an annual tuition fee of 36 marks ($8.57). Extraordinary students—that is, such as take partial courses—pay half this fee for one subject, and the whole of it if two or more subjects are pursued. All candidates for admission must be 16 years old, and present certificates of having worked at some trade for two years. They must also pass the entrance examination.

The eleventh annual report of the special division (*Fachabteilung*) of the trade continuation school at Munich, for the school year 1890–'91, states that this department is "a purely trade *Fachschule*, devoted to the technical education which fits one for a special trade."

The director and head teacher is Herr Graef, with whom are associated 25 assistants. The number of pupils enrolled in this department during the school year was 1,197. These pupils represented 84 different trades or callings, but more than one-half were cabinetmakers, painters, and locksmiths. Almost 25 per cent. of the whole number were over 25 years old.

Tuition costs the Bavarian student 2 marks (48 cents) per month; other German students, 4 marks (95 cents); foreign students, 6 marks ($1.43). The general instruction in this institution seems to be judiciously arranged, while the special teaching is most thorough and minute in its details.

NUREMBERG.

The annual report (1889–'90) of the Nuremberg Building Trade School (with the special schools for locksmiths, etc., and the evening school associated therewith) shows that this institution is in a flourishing condition. The attendance for the school year 1889–'90 was as follows:

In the day school, 330 against 291 in 1888–'89; in the winter evening school, 341 against 317 in 1888–'89; in the summer evening school, 23[illegible]

against 187 in 1888–'89; in the mechanical workshop, 6 against 3 in 1888–'89; total, 916 against 798 in 1888–'89.

The teaching force of this institution consists of the director and 24 teachers in the several departments. The object of this school is announced to be "to supplement, through regular instruction, the education of the following named technical workers for their business: Master builders (masons, carpenters, etc.); district and city master builders; machinists, mechanics, etc.; locksmiths; joiners, cabinet-makers, etc.; coppersmiths, etc."

It costs 3 marks (71 cents) to matriculate in the day school, and the tuition per half-year is 36 marks ($8.57). In the evening school the tuition fee is 4 marks (95 cents).

In the special schools (day) instruction is given in the winter months from November 2 to March 31, but practical instruction in the mechanical workshop is the only teaching carried on in the school of building construction during the summer half-year.

In the evening school, both summer and winter, instruction is given in five departments, from 7 to 9 o'clock, to such trade workers as are busy in their workshops during the day, in order to make it possible for them to extend their knowledge of industrial drawing, machine construction, etc.

Considerable attention is devoted to giving instruction in road and bridge building, and building construction in wood and iron.

The Nuremberg Women's Work School was founded in 1874 by Dr. von Cramer-Klett for the purpose of educating young women, not only for handiwork and household and trade life, but also for the purpose of fitting them thoroughly and systematically for the profession of teaching. From small beginnings, with one teacher and 30 girl pupils, this institution has prospered, until in the school year 1888–'89 the number of pupils in attendance was 530.

The school year consists of three divisions—two winter courses and one summer course. The first winter course begins September 1 and continues to the end of December; the second winter course opens January 1 and lasts till March 31, with daily instruction from 8 a. m. to 12 m. and from 2 to 4 p. m. Saturday p. m. there is no session. The summer course begins April 1 and ends with July, the daily teaching continuing from 8 a. m. to 12 m. and from 2 to 5 p. m. From the 1st to the 30th of August is vacation. At the close of the school year a public exhibit of pupils' work is given in the school room.

The matters taught are sewing, mending, knitting, machine sewing, tailoring, ironing, millinery, French conversation, water color and oil painting, religion, method of teaching, and pedagogics, with free-hand drawing.

Tuition in courses 1, 2, and 3 is 7 marks ($1.67) per month; in course 4 it is 8 marks ($1.90) per month. These are all day classes, but some pupils attend only one half of each day, either forenoon or afternoon,

and in these classes the fee varies from 3 to 6 marks (71 cents to $1.43) per month.

INDUSTRIAL TRADE SCHOOLS AND CONTINUATION SCHOOLS IN WÜRTEMBERG.

In no other portion of the German empire are schools of manual training and of industrial and technical art so numerous as in the little kingdom of Würtemberg. The report from which we quote (*Jahresberichte der Handels und Gewerbekammern in Württemberg für 1889*) gives a brief account of the continuation (*Fortbildung*) schools and schools for working women in the district. It is mentioned as an especially significant event that a farm school exhibition was held in the industrial hall at Stuttgart during the celebration of the twenty-fifth year of the reign of his majesty the king, from July 25 to August 25, 1889. The special significance of this event seems to have been that the exhibit represented the artistic skill or industrial work of more than 100,000 pupils from 539 different schools.

The continuation and other special schools of Germany undertake, as their name implies, to carry forward the work of the lower grades (*Volksschulen*), with the addition of instruction in some branch of manual labor. Yet there is an unexpected obstacle in the way of the greatest success in this movement.

In the Year Book it is said that experience shows that a continuance of the studies of the primary school, even in the elementary branches of reading, writing, etc., is indispensably necessary for many of the pupils in the industrial schools. Many of the pupils who in special studies show much proficiency have but a superficial knowledge of these elementary things. An earnest protest is made against the defective practical education.

The number attending the schools for working women in Würtemberg shows no falling off. The number of young women of the working class, between the ages of 14 and 20, who attended the school at Reutlingen during the year 1889, is reported to have been as follows: First quarter, 163; second quarter, 185; third quarter, 150; fourth quarter, 181. These pupils are taught hand and machine sewing, dressmaking, etc.

In a similar school at Ulm there were in all 292 pupils during the year 1889. At Heilbronn the total number for the same year was 703. Many of the pupils receive instruction in bookkeeping, accounts, etc., as well as in the various branches of domestic economy.

To show how universal is the demand for trade schools in Germany, and to indicate the extent to which they are supported by the people, it may be stated that according to the Würtemberg Year Book for 1888, 167 towns in this district reported the enrolment of students in their trade schools. The total number of pupils accredited to the towns in this list as belonging to special schools amounted in the

aggregate to 13,649. The population of these 167 towns was given as 740,987.

Throughout the entire empire great pains are taken to afford to the working people of both sexes opportunities for improvement in general knowledge as well as in technical skill. The existence of continuation schools for women in all the larger towns is a sufficient proof of this fact. In the Year Book for 1888 is given a list of fourteen cities in the district, in each of which a continuation school (of a general educational character) for women is maintained. Only 676 women were enrolled in the fourteen schools, however, during the year; a fact which is somewhat disappointing, especially when it is taken into account that these 676 women represented a population of nearly 200,000. But the record of sixteen cities, in which an equal number of schools for working women were attended by a total of 1,594 pupils during the year, is more satisfactory; although this number was gathered from a population of 328,000.

"The origin of women's work schools is to be sought in the city of Reutlingen", says the annalist of Würtemberg. "The Reutlingen women and girls have long been noted for their industry and activity. Knitting, crochet work, embroidery, and the making of many kinds of garments and articles of luxury from wool, cotton, and silk furnishes employment in that city for the innumerable hands of an industrious and contented people. Their products are everywhere known and valued under the name of 'Reutlingen goods' and are given the preference by a large number of business houses."

Hence it was that, in November 1863, under the direction of the teacher of drawing in the weaving school at Reutlingen, Herr Lachenmayer, embroidery came to be introduced into the school over which he presided. Thus did Lachenmayer incorporate with "the old Reutlingen manufacture a new, vital element."

The number of female teachers for industrial schools and schools for women's work, graduated from the Reutlingen school from 1870 to the end of March 1889, is 269.

From the statistical report on the educational system of the kingdom of Würtemberg for the school year 1889–'90, published under authority of the royal ministry of the church and school system, we take the following figures:

The number of agricultural continuation schools is 75, and the number of pupils, 1,710; the number of winter evening schools of agriculture is 679, and the number of pupils, 14,474; the number of Sunday schools of agriculture is 89, and the number of pupils, 1,994; the number of evening agricultural classes, 21, and the number of attendants, 688; the number of reading societies, 80, and the number of readers, 3,731. Connected with these schools of agriculture are 1,213 libraries containing 261,113 volumes.

In the Technical High School at Stuttgart there were in the school

year, 1889–'90, 26 head teachers, 17 special teachers and assistants, 8 private docents, etc.; in all, 60 teachers in the six *Fach* schools of this institution.

In these special courses the students were classified as follows: Architecture, 69; building engineering, 32; machine engineering, 85; technical chemistry, 88; mathematics, etc., 17; common educational specialties, 37; a total of 328. Of this number 203 were residents of Würtemberg, and 125 belonged elsewhere. Sixty-four of the 125 non-resident pupils came from other German states; 52 from other European countries; and 9 from extra-European lands—6 from the United States, and 1 each from the Argentine Republic, Brazil, and Peru.

The social position of the students is indicated by the occupations of the parents: 61 are sons of state officers; 32 are sons of other public servants; 179 are sons of tradesmen, etc.; 20 are sons of agriculturists; 36 are sons of physicians, artists, advocates, etc. The average age of the pupils October 1, 1889, was 22 years and 1 month.

The previous education (*Vorbildung*) of the 328 students is a matter of some significance. It is stated as follows: From Würtemberg real-schools, 65; from real-gymnasia, Stuttgart and Ulm, 46; from Würtemberg gymnasia, 28; from Swiss cantonal schools, higher burgher schools, etc., 36; from other technical high schools and universities, 53; from lower technical schools, 34; from other preparatory and private schools, 13; from practical occupations (architects, mechanics, pharmacists, teachers, officers, etc.), 53. Besides these 328 students the Technical High School of Stuttgart had in the winter half-year 206, and in the summer half-year 39 guests (persons who, though not belonging to the school, attended some of the lectures).

The Royal School of the Building Trades at Stuttgart has a faculty composed of 22 head teachers and 13 special and assistant teachers. In the winter course of 1889–'90 there were 503 pupils in attendance, of whom 370 were Würtembergers, and 133 from other parts of Germany and various foreign countries.

Classed according to occupations—17 were master workmen, 225 were masons, 109 were carpenters, 23 were land surveyors, 64 were metal workers, 17 were glaziers, tinmen, moulders, etc., and 48 were such as had learned no trade.

Grouped as to their preparatory education—164 were from the common schools (*Volksschulen*); from the intermediate, burgher, and lower real-schools, 139; from the Latin schools and the lower divisions of real-gymnasia and gymnasia, 91; from the higher burgher and upper real-schools, 101; from the higher industrial schools and special trade schools, 8. The youngest was 14½ years of age; the eldest, 36½ years; the average age, 19.55 years.

In the summer course of 1890 the whole number of pupils was 183. Of these 117 were from Würtemberg and 66 from other states—48 from other German states and 18 from foreign countries of whom 4 were from America.

Classified by occupations, the pupils were numerically distinguished as—master workmen, 4; masons, 36; carpenters, 18; those of no trade, 19; surveyors, etc., 17; mechanics, etc., 78; other trades and occupations, 11.

Thirty-six of these came from the common schools; 57 from the middle, burgher, and lower real-schools; 42 from the Latin schools and the lower grades of real-gymnasia and gymnasia; 43 from the higher burgher schools and upper real-schools; and 5 from the higher industrial and special trade schools and from technical high schools. The lowest age reported was 14; the highest, 37; average age, 21.02 years.

During the school year 1889–'90 there were industrial continuation schools in existence in 173 places in the kingdom of Würtemberg, representing a population of 755,531 souls.

These 173 continuation schools may be classified, according to their special equipment and purpose, as follows:

(1) Continuation schools in which Sunday and evening instruction is given in industrial (especially mercantile) specialties, and which have public drawing class rooms. Of this class of schools there are 26.

(2) Continuation schools with industrial Sunday and evening instruction, but without public drawing class rooms. These exist in 72 cities and 25 villages; in all, 97.

(3) Continuation schools with industrial instruction, but without Sunday teaching. Of these 1 is in a city and 2 are in villages; in all there are 3.

(4) Industrial drawing schools without other instruction. Of these there are 47.

The number of pupils in these 173 continuation schools (together with those in 14 women's schools and 19 women's work-schools) aggregated, in 1889–'90, 20,219, namely, 14,988 males, and 720 females in the women's continuation schools and 4,511 in the women's work-schools. Of this number 16,435 were under, and 3,784 over, 17 years. The number of teachers was 978.

The whole amount received from the state for the support of these schools was 166,407.76 marks ($39,605.05).

The numbers attending the several specialties of instruction were as follows:

Subject.	Attendance.
Industrial arithmetic, mental	5,499
Industrial arithmetic, written	6,772
Free-hand drawing, elementary	7,947
Free-hand drawing, advanced	2,758
German language, common idioms	2,370
German language, business usages	6,089
Special drawing, wood work	1,627
Special drawing, metal work	857
Special drawing, other specialties	3,410
Special drawing, industrial art	326
Special drawing, lettering	126
Geometrical drawing	4,531
Bookkeeping, industrial	2,309
Bookkeeping, mercantile	626
Ornamental writing	2,921

The continuation schools of Stuttgart include the following: Evening school, with 42 teachers and 586 male pupils; elementary school, with 22 teachers and 442 male pupils; Sunday school, with 27 teachers and 334 male pupils; women's continuation school, with 17 teachers and 209 female pupils; mercantile continuation school, with 28 teachers and 448 male pupils; a total of 136 teachers and 2,019 pupils.

The Industrial Art School of Stuttgart has 9 teachers. In the winter half-year 1889-'90 the pupils in the several classes of this school numbered—in the preparatory class, 32; modelling and wood carving, 9; furniture, 13; decorative painting and textiles, 30; carving, 9; in the course for drawing teachers, 11; a total of 104. Of these 104 pupils there were 93 from the kingdom of Würtemberg, and 11 from other states. As to age—there were under 16 years, 1; between 16 and 17 years, 7; 17 and 19 years, 38; 19 and 21 years, 32; over 21 years, 26.

With regard to the previous education of the pupils—37 were from the common schools (*Volksschulen*); 61 were from burgher, real and Latin schools, lyceums, and gymnasia; 2 were from technical institutions; 4 from industrial art schools.

In the summer half-year of 1890 there were in this school—in the preparatory class, 15; in the class of furniture, 7; in the class of modelling and wood carving, 7; in the class of decorative painting, 4; in the class of pattern drawing, 3; in the class of carving, 9; in the class for drawing teachers, 8; a total of 53. Of these 53 pupils 47 were from Würtemberg, and 6 from other states. Their ages were as follows: Between 17 and 19 years, 18; 19 and 21 years, 15; over 21 years, 20.

They were received from the following schools: From the common schools, 16; from burgher, real and Latin schools, lyceums, and gymnasia, 36; from technical institutions, 1.

The Women's Work School at Stuttgart, which is patterned after the original institution of the class at Reutlingen, is under royal patronage and is managed by a ladies' committee. Its object is by systematic instruction to give to girls a sound education in practical and artistic needlework, with the purpose of not only serving the needs of the family, but also of qualifying them to earn their living.

Especial attention is given to the training of technical and industrial teachers. The course of study is arranged in six divisions, each of which lasts three months, as follows: Hand sewing and patternmaking; drawing for embroidery and patchwork; machine sewing; dress sewing and cutting out; embroidery of all kinds; framework knitting, crochet work, and netting.

The systematic study of drawing is compulsory on all pupils. Other subjects are also taught, such as millinery, flower making, etching in metal and leather work. There is likewise a course of commercial training for women. Cookery instruction is about to be added. There are 160 pupils and 14 free scholars.

ALSACE-LORRAINE.

The Industrial Society of Mülhausen is perhaps the most powerful voluntary association in existence for the advancement of practical education. Organized in 1832 by the manufacturers of Alsace, it has ever since been a most beneficial agency for the promotion of the common interests of this community, where it originated.

The only branch of the society's work of which notice may be appropriately taken here is the Continuation School for Artisans, opened in 1883.

The annual report of this school for the year 1890–'91 announces the object of this institution to be, "to give young artisans an opportunity to improve and extend their school education," a statement which again illustrates by a fresh example the fact that there is very little of trade teaching, manual training, or technical education, as we understand such terms, in European "industrial schools." Most of these schools are like the evening classes in American cities, designed merely to make up, in part, for the lack of early elementary education on the part of boys and girls who, by stress of circumstances, are forced prematurely to engage in some handicraft for self-support.

The instruction in this school embraces German, French, arithmetic, and drawing and building construction for carpenters, masons, etc. There were 140 pupils in attendance at the opening of the school October 13, 1890. March 14, when the term closed, 93 pupils were present.

CHAPTER VI.

PRESENT STATUS OF INDUSTRIAL EDUCATION IN GREAT BRITAIN.

CHAPTER VI.

PRESENT STATUS OF INDUSTRIAL EDUCATION IN GREAT BRITAIN.

BEGINNING OF THE MOVEMENT.

Commencing about the year 1882, what has been termed a technical education scare swept over England, owing to the fear that Germany was competing with increasing success for the foreign trade of the world. This advantage was believed to be due to her system of technical instruction. As a result of this apprehension concerning trade a great deal of attention was given to the subject during succeeding years. A royal commission was appointed by parliament to inquire into the various technical and trade schools on the continent with a special view of reporting upon the effect the instruction given in these schools had upon the industries of the various countries in which they were situated.

While entertaining serious doubts as to the apprenticeship schools the commission, nevertheless, strongly favored the introduction of technical instruction into the elementary schools, and also the formation, in all industrial centres, of classes for affording instruction to artisans in the evening. Other recommendations were made with reference to scholarships, agricultural schools, etc.

Preceding the above reports, very little in the direction indicated in the reports was in progress throughout the country. In London Finsbury College was the only centre, apart from the Polytechnic Young Men's Christian Institute, that gave evening manual instruction, and even at Finsbury the number of real artisans in attendance was very small. In 1882, when the Polytechnic was opened, and the avowed aim of Mr. Quintin Hogg and his committee was to provide as far as possible for the educational requirements of the artisan classes, the whole movement received an impetus which, upon presentation of the commissioners' report, was still further advanced.

Slowly but yet surely the movement spread throughout the country, and today is given effect to in various ways by many institutions throughout the provinces. An additional impulse has recently been given to the movement by the passage of the technical instruction acts of 1889 and 1890. During the past year an especially large number of schools have been opened.

TECHNICAL INSTRUCTION ACTS.

Under the technical instruction act of 1889 a new and powerful impulse was given to educational progress. By this act it is provided that "a local authority may from time to time out of the local rate supply or aid the supply of technical or manual instruction, to such extent and on such terms as the authority think expedient, subject to the following restrictions," etc.

This confers, it would seem, sufficient discretionary power upon local authorities in appropriating the local taxes to the use of technical schools; but this provision is permissive, not mandatory. Local school boards have in many instances, however, promptly availed themselves of the provisions of this act; and on October 1, 1890, thirty districts were reported as utilizing the technical instruction act of 1889. It is estimated that the total amount which the counties in England and Wales will receive from the beer and spirits duties in aid of local taxation for educational purposes will aggregate £743,200 ($3,616,782.80).

In this act there is no ambiguity as to what the term technical means. Section 8 reads:

> The expression "technical instruction" shall mean instruction in the principles of science and art applicable to industries, and in the application of special branches of science and art to specific industries or employments. It shall not include teaching the practice of any trade or industry or employment. * * *
>
> The expression "manual instruction" shall mean instruction in the use of tools, processes of agriculture, and modelling in clay, wood, or other material.

It is clearly apparent that aid is not extended by this act to trade schools, but that what is in America commonly called manual training has been recognized as a legitimate branch of instruction by the British parliament, and, as such, entitled to the benefits of the new provisions. Under what is known as the local taxation act of 1890 supplementary provisions are made for facilitating technical instruction; and soon in every county and district this important educational reform will have made substantial progress.

In this connection we may properly transcribe the principal rules and regulations under which aid to science schools and art and technical schools in Great Britain is administered in accordance with the technical instruction act of 1889.

In the Science and Art Directory of 1890 the following rules are given as governing the administration of this aid:

> LIX. A fixed sum each year will be allocated for grants in aid of technical instruction given under the technical instruction act, 1889, or under the technical schools (Scotland) act, 1887.
>
> LX. The sum so allocated for the financial year 1891–'92 will be £5,000 ($24,332.50).
>
> LXI. The grant in aid will not necessarily be equal to, and in no case will it exceed, the amount contributed by the local authority out of the rates.

The conditions governing the allowance of grants for manual instruction in elementary schools and in organized science schools are mainly these:

3. The instruction must be (*a*) in the use of the ordinary tools used in handicrafts in wood and iron; (*b*) given out of school hours in a properly fitted workshop; and (*c*) connected with the instruction in drawing, that is to say, the work must be from drawings to scale previously made by the scholars.

* * * * * * *

6. If it appears that the school is properly provided with a plant for instruction, and that the teaching is fairly good, a grant of 6*s*. ($1.46), or, if excellent, of 7*s*. ($1.70) will be made for every scholar instructed, provided (*a*) that he has passed the fourth standard; (*b*) that he has received manual instruction for at least two hours a week for 22 weeks during the school year; (*c*) that a special register of attendance is kept; and (*d*) that each scholar on whom payment is claimed is a scholar of the day school and has attended with reasonable regularity. The grant may be reduced or wholly withheld at the discretion of the department, if it appears that the plant is insufficient or that the instruction is not good.

* * * * * * *

8. If the instruction for which the grant is made be for a period other than a year, the grant will be increased or diminished by one-twelfth for each month more or less than a year.

These regulations seem well calculated to secure proper and adequate instruction. Exception may possibly be taken to rule 3 (*b*), which requires that manual instruction must be given out of school hours, upon the ground that if manual instruction deserves to hold a place at all in the school exercises, it should be put on an equal plane with other regular and recognized branches of the curriculum.

Certain privileges are accorded to teachers and students in English schools which merit the highest commendation. Free admission to the South Kensington and Bethnal Green museums—including the science and art libraries—and to the Edinburgh Museum of Science and Art is allowed to teachers of public elementary schools; to students of the Normal School of Science and Royal School of Mines, National Art Training School, or of the Royal Academy of Arts and National Gallery; also to students attending science and art schools and classes, or training colleges.

MEANS OF SUPPORT OF INDUSTRIAL EDUCATION.

With reference to the means of support the institutions for technical instruction may be primarily classified as:

First. Those which exist by governmental support and authority alone.

Second. Those which, though generally founded by private enterprise or endeavor, usually prompted by philanthropic or religious interest, now receive more or less governmental support, either with or without further aid from manufacturing or other guilds or organizations.

Third. Those which have been created by associations or individuals,

guilds, or other organizations, and are maintained by them, their own earnings, and friendly donations.

Fourth. Those which have been established by institutions of learning as part of their educational system, or by individuals or industrial associations to advance particular interests.

Under the first of these classes it is surprising to note, when the vast industrial interests of Great Britain and the paternal character of her government are considered, that the government itself is so little directly interested, especially in its educational department, in industrial and technical instruction. Beyond being responsible for the elementary education in handicrafts and in technical branches included in the regular courses of study of the English national school system, the committee of council on education (constituting since 1872 the board of education for England and Wales) has no representation in the schools of industry or technology of the kingdom.

A collateral department of education, also under the management of a committee of the British privy council, the department of science and art, is somewhat more appropriately, yet quite inadequately, represented in the field of instruction seemingly so naturally its own. Its operations extend to the whole of the United Kingdom. It has been known by its present name since about 1853.

In 1836 a sum of £1,500 ($7,299.75) was voted by parliament for the encouragement of art, with which trade and navigation became associated. The first school of design was opened at Somerset House with 12 pupils, in 1837. Subsequently a sum of £10,000 ($48,665) was voted in aid of fourteen schools, and by this means art education was provided for about 2,250 pupils. This sum became exhausted in 1840, and since that date the amount necessary for each school, or for providing new ones, has been included in the annual estimates. In 1845 the Royal College of Chemistry was established in Oxford street, London; and in 1851 the Jermyn street Royal School of Mines was started. These institutions are now united under the title of the Normal School of Science and Royal School of Mines, at South Kensington.

Museums were opened at Dublin in 1855, South Kensington in 1857, Edinburgh in 1866, and Bethnal Green in 1872. A considerable sum has been expended on the collections of objects of interest, some of which are lent to provincial museums.

The Directory, containing regulations for establishing and conducting science and art classes, was started in 1860, and is now published annually as a parliamentary paper, forming an appropriate medium of communicating official information relative to subjects of instruction, dates of the various examinations, and other details. The annual May examinations were instituted in 1861, on the results of which grants, certificates, prizes, and scholarships are awarded.

The aim has been to supply more advanced instruction than is usually given in the public elementary schools, and to raise the intellectual

lectual character of the community; but the results rather point to the conclusion that the science and art department was appointed before its time.

The department has rendered valuable assistance to the cause of public education, in so far as it has been the medium of inducing teachers to qualify themselves to impart instruction in a number of most necessary branches of education. Numerous scholarships have been founded, and are awarded on the results of examinations held by the department. In 1868 the late Sir Joseph Whitworth offered the munificient sum of £100,000 ($486,650) for this purpose, which was accepted and supplemented with a like sum by the government.

There are two teaching scholarships in chemistry of the value of £50 ($243.33); four royal scholarships of the value of £15 ($73), and two of £25 ($121.66); two princess of Wales scholarships, value £25 ($121.66) and £11 ($53.53), respectively, etc. There are also rewards in money, books, medals, local exhibitions, assistance to teachers, and the like.

A limited number of teachers and of students in science classes who intend to become science teachers are admitted free to the sessional course of instruction in the Normal School of Science and Royal School of Mines. They receive third-class railway fare and maintenance allowance of 21*s*. ($5.11) per week while in London. In certain cases the allowance may be increased to 30*s*. ($7.30). Teachers are also assisted, in certain cases, to take a course of instruction in some of the provincial colleges.

The two distinctively technical schools of the science and art department are: (*a*) The Normal School of Science and Royal School of Mines, South Kensington, London, the appropriations for the maintenance of which school for 1889 were £15,879 ($77,275.15); and (*b*) the National Training Art School, South Kensington, London, the appropriations for which school for 1889 were £5,345 ($26,011.44).

The local schools of science, under the direct supervision of the department, in various parts of the kingdom, though often existing as adjuncts of public institutions of learning, are so dependent upon the government for their existence and are so variously conditioned as to make them more properly enumerable in this than in the second class. They required for 1889 an appropriation of £89,500 ($435,551.75).

The art schools and classes, national scholarships, etc., in local schools, received in 1889 £38,500 ($187,360.25). The same conditions exist as have been noted in regard to the schools of science.

The total expenses incident to the conduct of these widely scattered schools of science and of art in all parts of the kingdom reached in 1889 the sum approximately of £154,000 ($749,441).

It is obvious that it would be both impracticable and of little utility to obtain a complete list of these hundreds of schools, which, as engaged in one branch or another of technical (and occasionally of indus-

trial) training, derive their existence from the paternal functions of the government itself. These, together with the two government schools at South Kensington and the elementary instruction referred to of the national school system (except in so far as the wonderful collections of the British and other museums are most helpful collaterals), seem to exist as the only illustrations of the government's direct efforts in the diffusion of industrial and technical knowledge. The wide spread public interest in all that pertains to this subject, as already evidenced by numerous bills before parliament, will undoubtedly soon produce important and characteristic results in a governmental way.

Consideration of the second class of institutions brings us to an examination of those which, though founded by private or associate enterprise—generally from philanthropic motives, now receive governmental aid, with sometimes that of other corporate bodies.

By far the most active, effective, and important exponent of the government's interest in schools of this class—singular as it may appear to those not conversant with all the facts—is the board of charity commissioners, a department whose ordinary functions would naturally be supposed to be quite outside the lines of educational work, except perhaps as they might, in the most elementary way, be incident to workhouse or charity schools, etc.

Their connection with this work and the institutions of industrial and technical instruction is indeed unique, and the circumstances from which it arises would hardly exist apart from a centralized form of government, or a civilization as old and as marked by the appreciation of the humanities as that of England. Yet the relation sustained by the charity commissioners is as logical as it is beneficent.

The charity commissioners were created by act of parliament in 1853 to superintend the administration of charitable and educational endowments all over Great Britain. In 1853 Prof. James Bryce carried through parliament an act providing for the consolidation of all the old parochial charities in London (the objects of many of which had totally ceased to exist), and the application of the income to the welfare of the poorer classes throughout the metropolis, under the management of the charity commissioners, by means of facilities for industrial and technical teaching, the support of museums and libraries, the creation of recreation grounds, the establishment or aid of hospitals, asylums, and similiar provident institutions, and such other agencies as might approve themselves to the commissioners as promotive, in the language of the act, of "the physical, social, and moral condition of the poorer inhabitants."

As the result of the careful inquiry made by the charity commissioners, under the powers conferred by this act, into the great number of obsolete endowed charities, or those whose funds greatly exceeded the

needs of their objects, etc., funds and property were gathered to the amount of £3,000,000 ($14,599,500), affording an income of some £100,000 ($486,650) per annum, about one-third of which is available for the purposes named in the act.

As the result of their investigations the board concluded to assist technical education by methods best adapted to aid the lower classes, and determined that they could best accomplish this by night schools for apprentices and young people engaged in daily work; by supplementing rather than by supplanting the shop with the technical school; by confining their efforts to youths rather than including those of mixed ages; by improving the physical status of the workingman; and, lastly, by giving him these advantages at minimum cost rather than gratis, thereby developing in him the invaluable element of self help.

It is through the agency of the charity commissioners alone that the government becomes a disburser (and, singularly enough, a disburser only) to the several institutions engaged in manual and technical training approved by the board. For it is worthy of note that the means thus furnished are not a charge upon the government itself, but that, having taken into its possession (and very wisely) the funds originally bestowed by individuals upon other non-necessitous objects, it simply reassigns them, through its charity board, to newer, more virile, and more worthy recipients.

This fact but emphasizes the point, already noted, that by itself the government of Great Britain has as yet done but little outside its science and art department to forward the acquisition of industrial and technical knowledge, and little in that department to meet the needs of those who require it most.

The great impetus that has been given to improvement in the handicrafts and in technical acquirement on the part of the masses was due primarily (and is chiefly maintained in Great Britain today) to the persistent and remarkably intelligent zeal of a comparatively few individuals for the welfare of their less fortunate neighbors.

This has been excellently supplemented by the equally intelligent action of certain of the great manufacturing and commercial guilds for which London is especially famed, having, it is true, something of self interest to prompt them, yet actuated withal by much of the same broad purpose which stimulated their forerunners. Yet, thanks to the happily available funds at the disposal of the charity commissioners and the good management and disposition of the latter, nearly all of the best schools of technology in Great Britain, particularly those of the metropolis, are now of our second class, being recipients of material aid from the government through the hands of the charity board, their efficiency being thus largely increased.

Both the curricula and the arrangement of classes thereunder in not

a few of the schools of the second class are established with reference to the requirements of two very important central organizations which grant subsidies where certain conditions imposed by them are complied with. These are the department of science and art and the City and Guilds of London Institute. The methods employed by the first of these have been noted and its aid, oftener in the form of scholarships, prizes, etc., than of large subsidies, is extended to many institutions not founded by it, nor under its control further than its determination of certain courses of instruction is concerned.

It is probably true that the prizes, scholarships, certificates, and conditional grants of the science and art department are greater aids and incentives than they would be in the United States.

The City and Guilds of London Institute for the Advancement of Technical Education makes grants for successful instruction in technical subjects. It also restricts classes which receive its encouragement to young men actually engaged in cognate trades and requires evening instruction. Its scheme of technical study is well defined and its functions as an examining body are intelligently exercised. It is, however, as such, rather than as an instructive agent, that it is preëminent, though its great corporate powers, material wealth, and moral status have enabled it to accomplish great good throughout the kingdom.

This organization (constituted 1878) comprises in its membership nearly, if not quite, all of the principal manufacturing and mercantile guilds (the Drapers' Company excepted) of the city of London, some of them, *e. g.*, the Steelyards Merchants, and the Saddlers, dating from the tenth century. Its original act empowers it to promote the application of science and art to productive industry; to found, establish, endow, maintain, and conduct a central institute, in or near the city of London, and trade schools in London or provincial towns, and by means of lectures, classes, and examinations held thereat, or by such other means as may be deemed proper, to train teachers, and provide for the technical instruction of persons of both sexes engaged in the industries and manufactures in such sciences and arts as are auxiliary to those industries and manufactures, or any of them; to form, endow, and maintain such museums and collections of the products of science and art in their application to industries and manufactures, and to provide such libraries, laboratories, and workshops as may be deemed expedient; to accept gifts, endowments, and bequests of money for the purposes of the institute. Other bodies having similar objects may be affiliated.

The third class of technical schools, viz., those which have been created and maintained by individual or associated guilds, or by other organizations, etc., does not include any considerable number.

Like the department of science and art the City and Guilds of London Institute, while giving support and assistance to a large number of technical institutions both in and beyond the metropolis, has established and itself maintained three such schools which it directly controls, and which, as representing the more advanced instruction and the training school element, may take priority in their class. These schools are the South London School of Technical Art, the Central Institute, and the Finsbury Technical College.

These are non-recipients of government aid, so far as appears, save possibly as candidates for prizes, etc. It is not to be understood, however, that they may not be eligible to any such subsidies as either of the governmental departments concede. They were chiefly projected before the principal governmental aids were so available as now, and by those abundantly able to maintain them and assist others.

It is noteworthy that the greater number of the institutions in Great Britain today (especially in London), which give industrial and technical instruction, owe their existence to the efforts made by philanthropic individuals or associations to ameliorate the social condition of the humbler classes.

Some of the schools established by institutions of learning as part of their educational system, or by individuals or industrial associations to advance particular interests, are as follows:

Technical School, Newcastle-upon-Tyne, Northumberland county, England.
Durham College of Science, Newcastle-upon-Tyne, Northumberland county, England.
Owens College, Manchester, Lancaster county, England.
Yorkshire College, Leeds, York county, England.
Mason Science College, Birmingham, Warwick county, England.
University College, Bristol, Gloucester county, England.
University College, Nottingham, Nottingham county, England.
University College, Liverpool, Lancaster county, England.
University College, Dundee, Forfar county, Scotland.
Glasgow and West of Scotland Technical College, Glasgow, Lanark county, Scotland.
University College, Cardiff, Glamorgan county, Wales.
Sheffield Technical College, Saint George Square, Sheffield, York county, England.

Among schools established to advance local industries may be included the Manchester Technical School, Huddersfield Technical School, and Leicester Technical School. There are a large number of technical schools with social features, the Regent street Polytechnic being the most notable example. There are several which are still incomplete, but which are doing excellent work. Among these latter are the Finsbury Polytechnic Institute, the South Lambeth Institute, the Albert Youth's Institute, and the Woolwich Polytechnic. The last two are offshoots of the Regent street Polytechnic, and aim to reach

particular classes, the Woolwich school recruiting its membership principally from the Woolwich arsenal and dockyard.

NATIONAL ASSOCIATION FOR THE PROMOTION OF TECHNICAL EDUCATION.

Among the most active and efficient agencies in furthering the cause of technical education is to be reckoned the National Association for the Promotion of Technical Education, of which the Marquis of Hartington, M. P., is president; Sir John Lubbock, Bart., M. P., is treasurer; whose secretaries are Sir Henry E. Roscoe, M. P., and Mr. Arthur H. D. Acland, M. P.; and whose assistant secretary is Mr. H. Llewellyn Smith, B. A., B. Sc.

The object of this association is not to interfere with the teaching of trades in workshops, or with industrial and commercial training in the manufactory and in the warehouse. It desires to develop increased general dexterity of hand and eye among the young, which may be especially useful to those who earn their own livelihood, and at the same time improve rather than hinder their general education; to bring about more independent and thorough knowledge of those principles of art and science which underlie much of the industrial work of the nation; and to encourage better secondary instruction generally, which will include a more effective teaching of foreign languages and science, for those who have to guide commercial relations abroad, and to develop industries at home.

Here are plainly defined the purposes and the limitations of the effort which the association proposes to itself. Some of the difficulties encountered in reducing to practical effect the provisions of the technical instruction act, and some of the partial success achieved under it, are set forth in a report, made by the secretaries and assistant secretary of the National Association, and published in London in 1889, under the title, Technical Education in England and Wales.

ELEMENTARY MANUAL INSTRUCTION.

To begin with the elementary instruction in the lowest grade of schools we quote the remarks of the committee on this subject:

The kindergarten exercises, object lessons, etc., for the infant schools and lower standards, that come under the general title of hand and eye training, form a very desirable introduction to more advanced technical instruction. * * * But above the infant school nothing of the kind is done, as a rule, in primary schools; and it is much to be regretted that no provision is introduced into the new code making object lessons a necessary subject at least in the lower standards.

It is no doubt easy to say that a special syllabus, comprising a series of graduated object lessons, may be drawn up for the approval of the inspector. But, as a matter of fact, object lessons will never generally

become part of the curriculum until they are insisted on; and as their educational value in brightening and stimulating the intelligence of the children is admitted by all good teachers, it is most desirable that means should be taken to ensure their general adoption in elementary schools.

There are several forms which hand and eye training may take in schools. It may be conveyed by means of drawing, modelling, workshop instruction, or other manual exercises, such as sloid.

The only one of these forms of manual training which receives a grant is drawing.

Grants may now be proposed for manual instruction, modelling, wood work, etc., under the new technical instruction act.

Concerning the plan of teaching by object lessons the report says:

The London school board, 15 years or more ago, adopted a graduated series of object lessons to be used throughout its schools. "This scheme of elementary science lessons," says Mr. Sharpe in his report for 1887, "framed with the most intelligent care, has remained almost a dead letter for 15 years to the present time."

In 1887 the Drapers' Company placed £1,000 ($4,866.50) at the disposal of the City and Guilds of London Institute for the promotion of manual training. Through the efforts of the guilds the school board established wood work training in six centres in various parts of London for selected children from the board schools. The training began in January 1888. The pupils attended once a week for a whole morning or afternoon, thus giving up one school attendance per week for the manual training. The six centres thus provided for the instruction of 584 children. The classes are under the control of instructors and assistant instructors, the latter being practical joiners.

The instruction is designed to give the pupils an intelligent knowledge of the principles which underlie their work. Working drawings to scale are made for every exercise. All bench work is done to exact measurement, and every piece of wood is correctly lined before being cut or planed.

The experiment of the work has proved so successful that since 1890 the government has carried on the work in board and lower grade schools in London and the provinces.

A small class for sloid was held as an experiment for three months in the autumn of 1887, but, to quote the report of the school board, "The decision of the local government board in regard to the surcharge for instruction in manual training prevented the board from incurring any expenditure in connection with the class." The class would, therefore, have been discontinued, had not a member of the board defrayed the cost of the instructor's salary.

The report on this point concludes:

Manual instruction is given in a few other elementary day schools in London. Twenty to thirty selected scholars from Saint Jude's National School, Whitechapel, and as many more from the Castle Street Board School in the same district, receive instruction in wood work from workmen of the Guild of Handicraft in Commercial street. There are also

carpenters' benches in two voluntary schools at Westminster and in a few other schools scattered over London. Some of the ex-7th standard boys are under instruction in carpentry in Raine's Foundation Schools, Saint George-in-the-East. The instructions would be extended to children in the standards if attendance at the workshop were counted as attendance at school. No doubt manual classes are also held in several other schools which have not come under our notice.

There is encouragement and much of truth in the committee's remark, however, that—

The requirements of the people are not to be measured by the actual existing demand. It is an invariable law of educational progress that the demand has to be created along with the supply, and it is most satisfactory to find that this has actually been effected so far as regards certain districts where technical schools have grown up through voluntary effort. It is as much the object of the promoters of technical education to stimulate the demand as to increase the supply.

SECONDARY AND HIGHER INSTITUTIONS.

The report is much more satisfactory in that portion of it which deals with secondary and higher institutions. Among these the institution bearing the name of the City and Guilds of London Institute holds a prominent place.

The present operations of the institute include the Central Institute in Exhibition road, South Kensington, the Finsbury Technical College in Leonard street, and the South London School of Technical Art.

CENTRAL INSTITUTE.

Central Institute, Exhibition road, London, S. W., was opened in 1884. It is designed to give advanced instruction in that kind of knowledge which bears upon the different branches of industries, whether manufacture or arts. The management is by a committee and board of studies. It is understood that the building cost £75,000 ($364,987.50), and the furniture, fitting, and appliances, £25,000 ($121,662.50). The courses of instruction are arranged to suit the requirements of persons who are training to become technical teachers, preparing to enter engineering or architects' offices, or desirous to acquaint themselves with the scientific principles underlying the particular branch of industry in which they are engaged. The complete (three years) course involves instruction in four departments, and there are lecture courses embracing mathematics and mechanics, engineering, mechanism, and the application of dynamics to practical problems, strength of materials, etc.; hydraulics, practical physics, surveying, electrical technology, and chemistry. The elementary teachers' courses are carpentry and joinery (elementary and advanced) and experimental physics.

The summer course for teachers and others includes lectures and laboratory work as follows: Mechanics of construction; chemistry,

with special reference to the requirements of architects, builders, and engineers; testing of dynamos and motors; graphical statics; methods of determining the fundamental standards of electrical measurements; gas manufacture; paper manufacture; lighting, warming, and ventilating; building.

Candidates who desire to qualify for the diploma are required to pass an entrance or matriculation examination in mathematics and mechanics, mechanical drawing, physics, chemistry, and French or German. On the results of this examination the scholarships are awarded. The entrance examination fee is £1 ($4.87); the fee for matriculated students (complete course), £25 ($121.66) a year.

The lecture courses vary from £1 to £6 ($4.87 to $29.20) per term or session, according to the subject taken. Elementary teachers, 10*s*. or 15*s*. ($2.43 or $3.65) for the course of twelve lessons. There are special terms for laboratory work. The scholarships comprise: One, value £60 ($291.99) a year for two years and free education the third year; three, value of students' fees for three years; two, of £30 ($146) a year for two years—one with and one without free education; one, of £50 ($243.33) for three years. The building is replete with scientific apparatus and appliances, laboratories, and workshops.

The following table shows the number of students attending the Central Institute in 1887–'88:

Course.	Students.
Full course	66
Partial courses	56
Single courses of lectures or short special courses	15
Summer courses	175
Carpentry class for elementary teachers	90
Experimental physics	29
Total	431

"It must be acknowledged," the committee remarks, "that the supply of students has hitherto been hardly equal to the expectations formed at the outset. Too much stress, however, must not be laid on this fact. The institution has been open for but five years, and it has certainly been at least as fortunate as the normal school in its earlier years. The fact is that the demand for very high class technical instruction has to be created as well as the supply, and until technical classes are more widely diffused throughout the country than at present, there is little demand for the training of technical teachers. Both these defects will cure themselves in time."

FINSBURY TECHNICAL COLLEGE.

Finsbury Technical College is situated in Leonard street, City road, London, E. C. The management, vested in the council of the City and Guilds of London Institute, is by committee. There are day and evening de-

partments. Day students must be not less than 14 years of age and pass an entrance examination. They are expected to take a course of two or three years. The courses of instruction are arranged under five departments. Those for day students being—mechanical engineering and applied mathematics; electrical engineering and applied physics; industrial and technical chemistry; applied art; and the building trades. The evening classes are arranged in groups of trades: Mechanical engineering; electrical engineering and instrument making; manufacturing chemistry, and industries involving the application of chemistry; the art industries, including cabinetmaking and decoration in color and in relief; and the building trades. All these departments are admirably divided into groups of two, three, or four divisions, each with subdivisions of detail occupying many pages in the calendar. This wide range of subjects of most useful instruction places the college in the very front rank of technical institutions; and a large number of students avail themselves of the exceptional advantages to be derived from attending the evening classes. The fee for day students (complete course) is £15 ($73) per session (a year); for evening classes (according to subjects), 6*s*. to 15*s*. ($1.46 to $3.65) for the session of about eight months; for art classes, 17*s*. to 25*s*. ($4.14 to $6.08). There are four studentships (two annually open to public elementary boys) of £30 ($146) a year for two years; one of £20 ($97.33) and free education at the college; there are also open scholarships. The total attendance in day and evening classes in 1888–'89 was 1,181 students.

In the applied art section of the college drawing, design, and painting are taught in relation to their application to various industries, besides art metal work, modelling, carving, etching, etc. The college course is regarded as a real preparation for entering the factory or workshop, where, to quote the language of the principal, they "complete a modified form of apprenticeship."

The course, except in the case of the chemistry department, lasts for two years. The results of this scheme of instruction are briefly this: That the students who have followed out their course enter industrial life under much more favorable conditions than otherwise they could have done. They pick up in the shops in two or three years more than they would have done in five or six years under the old apprenticeship system.

The college is well supplied with teaching appliances, laboratories, and workshops. Perhaps this college may be said to be the best exponent in Great Britain today of advanced technical training. It is not, however, equal in either its methods, morale, or facilities to the first-class institutions of its character in the United States, though, doubtless, in some respects, better adapted to the present requirements and status of technical teaching in that country.

SOUTH LONDON SCHOOL OF TECHNICAL ART.

The third school of the City and Guilds of London Institute is the South London School of Technical Art, situated in the Kennington Park road. It is now attended by about 150 students. Most of the classes, which include modelling, design, house decoration, china painting, wood engraving, etc., are held in the evening, but there are also a few day classes. In the school art is studied especially in its bearings on industries, and the school is said to have had considerable influence on the decorative trades of the neighborhood, and its prosperity varies with their prosperity. It is clear that a great deal of good work has been done in the school with very limited resources, and the list of past students who have made a mark in artistic handicraft is one of which any school might be proud.

LOWER MOSELEY STREET SCHOOLS, MANCHESTER.

The Lower Moseley Street Schools of Manchester, from the date of their institution in 1836, seem to have prospered in an unusual degree, and to have won their way to popular favor. Connected with these schools are societies whose various names imply a great diversity of objects to be attained, though all of them have the same ultimate tendency. Among these are a singing class; a mutual improvement society; a girls' club; cricket, football, swimming, and chess clubs; a natural history society; and a maternal association. Instruction in secular subjects is given to evening classes.

The object in establishing these classes is to stimulate the desire for knowledge amongst young men and women, to afford pleasant and profitable occupation for their leisure time, and to give, as far as possible, sound instruction in the various subjects taught. Many of the classes are, moreover, of real practical value to the working man, and are aided by the government, with a view of increasing his skill as an artisan by the diffusion of scientific and artistic knowledge.

The courses of study take a wide range, including, in the elementary classes, reading, writing, arithmetic, geography, history, and shorthand. The commercial classes take bookkeeping, typewriting, and shorthand, together with French, German, Italian, Spanish, and Latin, grammar, and commercial arithmetic. The science classes receive instruction in physiology, botany, chemistry, mechanics, magnetism and electricity, mathematics, etc.; while in the art classes free-hand, model, perspective, and geometrical drawing and designing are taught.

MANUAL TRAINING SCHOOL, MANCHESTER.

The Boys' Commercial and Manual Training School, in connection with the Manchester Technical School, is designed to develop harmoniously all the faculties by means of a systematic and progressive course of intellectual and manual training, which has for its express object the cultivation of the power of observation and the forming of the judgment.

intended to teach a trade, but simply to provide for a
te education for both head and hand, etc.
rst year's course embraces language and literature, geography
tory, four hours per week; the higher rules of arithmetic and
natics, five hours per week; writing (including bookkeeping and
graphy), free-hand, model, geometrical, and perspective drawing,
a hours per week; elementary science, five hours per week; tool
uction in carpentry and wood turning, six hours per week.
ne second year's course includes advanced studies in all the fore-
ng subjects. The course of instruction forms an excellent introduc-
n to the mechanical, electrical, and sanitary engineering, chemical,
eing, and textile departments of the school.

According to the seventh annual report of this school (1890) the
otal number of pupils enrolled in this department was 75.

This report contains the following interesting comments:

Now that manual training is receiving that public appreciation and
attention which it so much deserves, and for which it has hitherto so
vainly struggled, it is of some importance to recognize the fact that this
is the first school in the kingdom to embrace it as an organic part of a
boy's education, to be carried on side by side and in close coördination
with other more purely literary studies. Its success is not to be measured
ured by the comparatively small number of boys who have been enrol-
rolled, but by the stimulus and example it has afforded and the conclu-
clusive proof it has given that not only can manual training be readily
arranged so as to form part of a boy's instruction, but that it is absol-
lutely essential to a full development of his faculties. * * *

The results have fully justified its maintenance and continuance. It
has, in numerous instances, helped to determine the pupils' aptitudes
and fix their careers. Many who, under ordinary circumstances, would
have simply swelled the overstocked ranks of clerks and warehouse-
men, have, under the stimulus and training they have received, en-
tered upon some business where manual skill and dexterity are essen-
tial conditions of success. * * * It is a matter worthy of note that
had these boys, during their previous school career, had some such hand
and eye training as is implied by a carefully graduated kindergarten
course, they would have been in a much better position to profit by the
subsequent training of this department.

Such commendations and strictures deserve attention, since they are
not the words of mere theorists, but of men that have had practical
experience of the value of manual training as an intellectual discipline.
They serve, also, to emphasize the importance of organizing the
mary, secondary, and intermediate grades of instruction in such a
ner as to make each successive step in the process of education
tinct and well timed preparation for advancement to the next
grade.

SHEFFIELD TECHNICAL SCHOOL.

In connection with the technical school at Sheffield there is
department whose object is to provide a course of in
boys, which shall have reference to their futu

ments in trade and manufacture. The instruction is largely supplemented by work in the laboratories, where principles are illustrated by experiments performed by the student himself, and in the workshops, where manual exercises are performed at the bench and lathe. The subjects taught in this department include arithmetic, algebra, geometry, mechanics, heat, chemistry, geometrical and mechanical drawing, lectures on local industries, use of tools in the workshops, French, German, typewriting, and shorthand.

The wood and iron workshops are supplied with all the necessary tools and appliances for a useful course of manual training, but no attempt is made to teach special trades. The work performed by the students is executed from working drawings previously made by themselves. In the testing room experiments are conducted on the strength of materials and simple structures by actual breaking with deadweights, and on the elementary principles of construction.

The hours of attendance daily, except Saturday, when there is no school session, are from 9.30 a. m. to 12.30 p. m., and from 2 to 4.30 p. m.

Each student pays a tuition fee of 10*s*. ($2.43) per month of actual school work; but six free scholarships are available in this department, entitling the holders to instruction in all the subjects taught. These scholarships are awarded on the result of a competitive examination, and are tenable for one year.

STOCKPORT.

At Stockport there is a day school for boys and girls, the main object of which is said to be to continue the education of boys and girls, beyond the public elementary schools, in such a manner as to give them a thorough grounding in science and art, and by a judicious combination of practical and theoretical instruction to develop manual dexterity side by side with the mental faculties. The students will be placed in the best possible position for subsequently acquiring a practical knowledge of a trade or profession, and will be enabled with advantage to take up the study of more purely technical subjects.

Here is a clear and explicit avowal of a purpose to conduct the school instruction in such a way as to bring manual training into close and vital relations with the secondary education in the schools of lower grade. At the same time the limitations of manual training are distinctly defined. Not to teach special trades, nor to supercede apprenticeship, is the aim in this school; but so to develop the faculties and educate the hand as to equip the pupil for the duties of life, whatever they may be.

Drawing, building construction, mathematics, chemistry, sound, light, heat, theoretical mechanics, French, shorthand, bookkeeping, English composition, manual training in the use of tools, cookery, needlework, sick nursing, dressmaking, millinery, and starching and ironing, are the subjects taught.

The sessions of this school cover about forty weeks per year. The school hours are 9.30 a. m. to 12.30 p. m., and 2 to 4.30 p. m. on five days per week, there being no classes on Saturdays. The fee for attendance is 1*s.* (24 cents) per week, including stationery.

The teaching staff consists of the principal and 19 assistant teachers; but no record of the number of students in attendance in any of the departments is accessible.

ROBERT GORDON'S COLLEGE, ABERDEEN.

At Aberdeen, Scotland, an institution known as Robert Gordon's College is in operation, with day and evening classes, to which both sexes are admitted. Connected with it is a day department called the trade and engineering school, though the title is hardly exact. It is properly a manual training school, and its aim is to put boys in a position to profit to the full by the apprenticeship they are about to enter, at the age of 15 or 16 years, thoroughly equipped as to preliminary knowledge. It is by no means intended that a boy should learn his trade in the college, but only that he should lay the foundation of the scientific and technical knowledge which has become an essential concomitant of trade experience and manual dexterity. This explanation determines the status of the day school, for the completion of whose course an attendance of two years' duration is necessary. In the evening classes instruction is given to apprentices in several technical branches throughout a four years' course.

The registration of pupil apprentices in each of the technological classes for the year 1890–'91 is reported as follows:

Telegraphy	18
Plumbers' work (theoretical)	23
Plumbers' work (practical)	9
Watch and clock making	10
Metal working tools	23
Mechanical engineering	12
Carriage building	12
Carpentry and joinery	9
Total	116

BIRMINGHAM TECHNICAL SCHOOLS.

The Birmingham Municipal Technical School is to be rated as a manual training school of high grade. This school was established for the purpose of carrying out a liberal scheme of technical education, which was rendered possible by the technical education act of 1890. It does not undertake to teach the practice of trades in the class room. This can be properly learned only in the workshop. But, in the school, the student learns the scientific principles on which the various local

industries are based. The Birmingham Seventh Standard Technical School is under the control of the Birmingham school board. Instruction is given in the school in those sciences and arts upon which the trades and manufactures of the town are based. It is contended that the result of such instruction in the board school is that a boy instead of having possibly to spend two or three years as an errand boy before being initiated into some handicraft with which he is entirely ignorant is, after spending a couple of years at such a school, enabled to enter a manufactory already instructed in the use of tools of the craft he is about to follow; as a consequence of intelligent training in the elementary principles, he is enabled at once to command higher wages, and is a more thoughtful and original worker. It is also argued that in consequence of the decline in the apprenticeship system some such preliminary training is requisite in order that a lad may learn more than just one particular branch of his trade.

As a result of the introduction of machinery in every branch and detail of manufacture a workman is frequently kept upon one special description of work. If the demand for the article, upon which perhaps he has for years been at work, declines he is placed at a great disadvantage in regaining employment as he has had no general training. The result, therefore, of the system adopted by the school board is felt to be that employment will not only be more constant, but that the work of the skilled mechanic will be of more value, and consequently it will be accompanied by an increase in wages.

Parents entering their boys in the Birmingham Seventh Standard Technical School have to sign a declaration that they will keep the boys at school for a period of at least two years. This is done to insure their receiving an adequate and proper course of instruction, and also to enable them to earn the government grants in the science subjects for the two years.

In this school the subjects taught are arithmetic, drawing, theoretical and practical mechanics, chemistry, electricity, model and machine drawing, geometry, and principles of machinery, with laboratory and workshop practice.

The school board believes it necessary to provide for the technical training of artisans, and states the case as follows:

Competition with the better trained workmen of the continent and America is becoming more and more severe every day, and is actually taking some of the means of livelihood away from the English workman. A more thorough and more scientific training of the artisans of Birmingham will greatly improve the articles manufactured here, in style, design, and delicacy of workmanship, and will also lead to a lessened cost of production; the trade of the town, where it now languishes, will revive; new developments of mechanical skill will open out new trades; employment will be more constant; and the wages of the skilled workman will rise.

In the report of the Birmingham school board for the year ending

vember 28, 1889, regret is expressed that school boards have no wer to introduce technical or manual instruction in schools under ir control; but it is understood that the act of August 19, 1890, re ves this cause of complaint. The provisions of the law are, howeve newhat obscure, and have given rise to considerable controversy.

BIRMINGHAM SCHOOL OF ART.

Birmingham has a municipal school of art, whose influence on local lustries is incalculably beneficial. In this school and its eight nches there were enrolled at the date of the latest report to which have access, namely, in the autumn of 1886, 1,307 art students. ny of these were artisan students; and the committee state, that it their purpose to facilitate as much as possible the art instruction of ose engaged in the trades of the town. Consequently, in the branch hools, where the attendance is chiefly composed of artisans the fees ve been fixed at the low rate of 3*s*. (73 cents) per term.

The course of instruction includes elementary drawing, drawing from dels, elementary design, perspective, practical, plane, and solid and ometry, outline and shading from nature, casts, and objects, machine ne istruction and drawing, and building construction. In five of the the nch schools instruction in elementary modelling is also given.

REGENT STREET POLYTECHNIC DAY SCHOOL.

Another class of day school is represented by the Polytechnic day hool. At this school the committee realize the importance of spe lizing the course of instruction a boy receives, so as to fit him to fill th greater advantage the special vocation he is afterward to follow. cordingly at the age of 13 (or before, provided the boy can pass a alifying examination) the future studies of the pupil are specialized. ould it be the intention of the parent to place the boy in some pro sion he is placed in the professional division. If to enter the civil vice is desired then the boy is placed in that division which pre res specially for the examinations. In the commercial division a y receives a special course of training for the office and for commer l pursuits.

In the technical division the curriculum is altogether different and ludes instruction in science and technical subjects, also a complete d systematic course of manual instruction in the workshop. The ter instruction is virtually a continuation of that given in the lecture om, every example having to be constructed from working drawings oduced in a workmanlike manner in the drawing office. For con nience and regularity of instruction a regular text book has been pre red for the workshop, and not until the examples contained therein ve been made by the pupil is he permitted to engage in more difficult ces of work.

The advantage of such a school has been most apparent from the number of applications for boys that have been made by employers. Many of the firms which have taken the lads are among the best in London, and many of the appointments that have been obtained are those for which as much as £200 ($973.30) premium has been paid by apprentices entering the firms. It is, however, to the advantage of an employer to take a well trained lad as an apprentice, and, even without a premium, pay wages to commence with, for without question such a boy will get through his work quicker, will waste less material by trial and error, and will require less attention bestowed upon him than a poorly educated lad.

The number of boys in the school exceeds 500. There is, however, an upper department or engineering school, where even a higher grade of instruction is given to those preparing for colonial engineering appointments, or for special positions in mechanical, civil, or electrical engineering firms. In this division, termed the engineering school, higher branches of the sciences are taught, special attention is given to mechanical draughtsmanship and designing, and every possible effort is made and facility afforded to develop originality. Lads usually remain in this department for at least two years after leaving the lower school, and many of the old scholars now hold most important and lucrative appointments in different parts of the country. The average cost of instruction for each boy amounts to about £8 ($38.93) per annum, or, after deducting an average government grant of £3 10*s*. ($17.03), a net cost per boy of about £4 10*s*. ($21.90). This high average is due to the expensiveness of manual instruction, which involves not only costly tools and machinery that constantly need replenishing, but also the employment of skilled and efficient manual instructors who command a high salary. It is necessary to obtain the sanction of parents to keep the boys at their specialized studies for a period of at least two years in order to obtain a thorough course of instruction.

PEOPLE'S PALACE DAY SCHOOL.

A school upon the model of the technical division of the Polytechnic was founded in connection with the People's Palace for East London. This school has now been taken over, together with all the evening classes conducted at that institution, by the Worshipful Company of Drapers, one of the wealthiest of the guilds of the city of London. There are at the present time some 350 boys in the school, about 300 of whom obtain their instruction free of cost.

Examinations are held each year, when about 150 free scholarships are granted. By this means the very best boys are secured for the course of training given, and the results are consequently of a satisfactory character. The net cost per boy at the People's Palace school, without taking rent of building into consideration, amounts to about £5 10*s*. ($26.77) per head. To maintain the educational department

of the school the Drapers' Company grants the sum of £6,000 ($29,199) per annum, the schools having been built by them at a cost of £40,000 ($194,660).

It is proposed to organize similar schools in connection with each of the proposed polytechnics that are at the present time in course of erection. The greater part of the funds have already been subscribed, and it is confidently anticipated that within the next two or three years every district of London will have its own polytechnic.

TECHNICAL SCHOOLS.

The executive committee of the national association, in the report already quoted, speaking of the class of schools of which the Polytechnic, the People's Palace, the Bradford, and the Huddersfield schools are examples, pertinently observe:

The materials do not exist for the construction of a table giving a complete account of the technological classes of these institutions. The importance attached to various technological subjects varies with the character of the staple industries of the district in which the particular technical schools are situated. Thus, textile instruction forms a special feature of the schools at Bradford, Huddersfield, Keighley, and Macclesfield; at Sheffield the iron and engineering industries are more especially considered; while at Bristol and Leicester (both centres of the boot trade) classes are held in boot and shoe making. Classes bearing on lace making and designing are held at Nottingham; watchmaking is specially studied at Coventry.

It is not easy to know what institutions to include in the list of science and technical schools and what to exclude.

And again, in a general survey of the situation, it is stated:

The chief thing that strikes us in reviewing the educational position of London [the observation would hold good if applied to the whole kingdom, apparently] is the entire want of system and of all attempts at coördination among the numberless educational institutions intermediate between the elementary school and the university. At the bottom of the scale stands the well organized system of elementary education; * * * at the top stand two institutions of university college rank; * * * but the intermediate educational system of London presents the spectacle of a number of overlapping and competing institutions with no attempt at harmony of action, and leaving gaps of the most disastrous kind unfilled.

Finally, suggestions for the reform of the whole educational system of England are made in the closing words of the report; and as these suggestions are possibly as applicable to our own school system as to that of Great Britain we transfer the bulk of them to our own pages:

There is little need nowadays to speak at length on the need for a wider diffusion of technical instruction. It is a want which at last seems to be recognized, and is being gradually met in an irregular and piecemeal fashion by voluntary effort. Voluntary effort, however, will be quite inadequate to cover the whole ground, and now that some progress has been made towards legislative action in the matter it is *to be hoped* that something more systematic can be effected.

The necessity for improvement in the quality of technical instruction is insisted upon.

If the present movement for technical education is to end in the mere multiplication of science and art classes, formed by incompetent teachers dependent on grants for their livelihood, it may be that the resulting evil will outweigh the good. If the technical school of the future is to consist of an ill assorted collection of such classes as are found by experiment to be the most paying—from the point of view not of the education of the boy, but of the remuneration of the teacher, omitting all those humanizing studies which are merely educational, and not grant-earning—the cause of secondary education will not be advanced, but rather thrown back by the change.

To this end, it is contended, the secondary education should be reorganized, so that there may be, in the words of the late Mr. Matthew Arnold, "a correlation between popular instruction and the instruction above it."

REGENT STREET POLYTECHNIC.

The efforts to improve the technical education of apprentices and young mechanics in evening classes has nowhere been more successful during the last eight years than at the Polytechnic Young Men's Christian Institute in Regent street. This institution was the first of its kind to receive the adhesion and support of all sections of the working classes, and has, without question, done more to popularize technical instruction than any other effort in the kingdom. The work was first started by Mr. Quintin Hogg, in the form of a social effort among working boys, and carried on in a small building near Drury Lane in 1873. Mr. Hogg secured a room and made it a meeting place and club room for about 20 boys, who enrolled themselves as members. The spirit and enthusiasm that were put into the work soon resulted in the numbers increasing. Mr. Hogg accordingly increased the number of rooms until very soon the whole house was requisitioned, by which time there was an active membership of over 200 youths.

In 1878 Mr. Hogg, being greatly encouraged by the result of his efforts, secured considerably larger premises in Long Acre, capable of accommodating 500 members, and so numerous were the applications for admission that this number was at once obtained. The organization of the institution was at this time considerably altered, and that which was originally started only as a social club on Christian principles now added a considerable number of agencies to its curriculum. Various clubs and societies, physical, athletic, literary, and religious in character, were started, and, at the same time, what was in those days considered a spirited programme of evening classes was arranged and opened to young men, both members of the institution and others. Membership of the institute was limited to young men between the ages of 16 and 25, and these limits have remained in force until the present time. This decision was arrived at after a full consideration, as it was felt that to successfully influence the members for good they must be more or less of the same age.

oes this restriction in any way reduce the membership that would
btained were there no such restriction?

t is believed that just the contrary is the case, and, as an evidence of
s, the fact may be mentioned that for the last ten years the school
always reached its full limit of membership, which, at the pres-
time, exceeds 5,000, and not only so, but always has some applicants
ting for admission as vacancies occur, candidates having to wait
nths before being admitted. While this is the case at the Polytech-
, we do not know of a single other institution of a similar character
ere the membership exceeds 2,000, and where the demand is such
t candidates have to wait at all for admission. This fact alone
ld fully justify the authorities in making such restriction, but the
k of catering for the social requirements of members has thereby
n rendered more easy, and the direct results, where the institution
exercised a moral, intellectual, or spiritual effect, are far more
nerous than they would have been had no such restriction been
pted.

While this rule applied to membership of the institution, it was felt
e quite unnecessary to apply the same to students of the classes;
a student, whether old or young, while he attended any course of
truction, had to follow out the regulations for study as laid down by
instructor, and was equally subject to the discipline of the class.
was also inadvisable to impose the restriction in the classes, for the
nts made by the government to successful students in science and
subjects would thereby have been sacrificed, as the government
ctions no limitation of age. Moreover, if the institution had not
peted in these examinations, it would have lost all those students,
they were many, to whom the certificates granted by the govern-
t were necessary in order to enable them to qualify for certain ap-
ntments. The educational effort met with such appreciation that
department soon received considerable attention from Mr. Quintin
gg. At that time scarcely any institute in London made special
rts to meet the requirements of the working classes; consequently
educational work became an important item in the programme of
institution.

Prosperity continued to attend the work, and the cry for more room
continually being heard. In 1882 the building occupied by the
horities of the Royal Polytechnic Institution came into the market,
the lease was purchased by Mr. Hogg. As the premises were not
gether adapted for the purpose required considerable alteration was
essary, and Mr. Hogg has spent altogether over £60,000 ($291,990)
he purchase of lease, extension, and adaptation of the present build-

The acquisition of such extensive premises enabled the educa-
al work to be expanded in such a manner as to attract more o
the whole of London by the practical, comprehensive, and at the
e time novel scheme adopted. Workshop classes in several trades

were for the first time opened to apprentices and young mechanics, and popular courses of instruction based upon the syllabus laid down by the City and Guilds of London Institute were given, but where such syllabus was defective of practical application, as in many instances it was, such defects were supplied. The instructors themselves were the most skilled and capable mechanics that could be obtained, instead of mere theoretical and scientific instructors.

This was in itself a great innovation, and a step which, although previously ignored, has since received the unqualified approval of educationists. The class rooms were thoroughly fitted up as workshops, not in any fantastic or superficial manner, but with tools and appliances that gave all the advantages and avoided all the disadvantages of ordinary workshops. The instruction being given by skilled workmen, the language used was such as to be thoroughly understood by all the students; ordinary, every day workshop difficulties were explained, and the special needs of each student attended to in such a manner as to enable him to overcome all difficulties. In order to make the place as attractive as possible, and to meet the requirements of those who would be unable to go home and dress before attending, students were encouraged to come straight from the workshop in their ordinary working clothes. Lavatories with hot and cold water, accommodations for boot cleaning, etc., were provided in order that those so coming could have the convenience of a wash and brush up free of charge.

A comfortable refreshment room was provided, so that those who required it could obtain tea or light refreshments at the lowest rates. Intoxicating liquors and smoking have never been permitted in the institute, and their absence has undoubtedly helped materially in the success achieved. In order to get hold of the real working classes workshops were visited for some considerable distance, and the advantages of the instruction advocated, the coöperation of employers was also sought and obtained, the result being that at the very commencement nearly every class was filled. With such an admirable start the movement received an immense stimulus, and the press chronicled at frequent intervals the doings of the institute. The Trades Council of London, which is composed of representatives of all the trade unions, visited the classes officially on two occasions, and on each visit they gave so favorable a report that at the conventions of the trade unions resolutions in the highest degree favorable to the classes were adopted. At one meeting of delegates, representing all the trade unions in London, a resolution recommending the polytechnic classes to the London workmen was unanimously adopted.

The royal commissioners appointed by parliament to inquire into the progress of technical education on the continent visited the institute soon after it was opened, and, although the work had only just been launched, Mr. Woodall, M. P., one of the commissioners, stated that the instruction was of a far more practical character than he had seen at

any other institution the commissioners had visited. From the very first the instruction in the trade classes was limited to those who were apprentices, or others already engaged in the trade, the object rightly being not to create a number of amateurs, or third-rate workmen, but rather to make those who had already joined the craft more intelligent, thoughtful, and skilled mechanics. Another feature of the institution which helped greatly to make it a rendezvous of so many young men must not be omitted. The large central hall, 100 by 40 feet, was converted into the finest gymnasium in London. At the time of the opening of the Polytechnic very little was done to promote physical recreation in London, and this proved an immense attraction.

It drew hundreds of young men who, being interested in gymnastics, joined the institution, and in most instances some of the classes also. The success of the gymnasium had also a remarkable effect in London, and whereas ten years ago gymnasiums were virtually unknown in connection with clubs and institutes for young men, now there is scarcely an institution without one. Besides the gymnasium a very handsome swimming bath 75 by 35 feet was built, and this was as well patronized as the gymnasium. The athletic club, which is now the largest of its kind in the kingdom, also proved a valuable method of drawing young men to the place. A reading room, the formation of societies connected with some of the trades, and other social agencies were all used to attract and help young men. There was also another agency—the religious work—the power of which has over and over again been acknowledged as contributing in a great measure to the success of the whole effort.

It will thus be seen that the secret of success has been in the combination of the efforts put forward for the welfare of young men, and by this combination the work of the institute soon became familiar in all parts of London. Each year the number of classes and students on the list has increased until last year the total class entries during the year exceeded the almost incredible number of 10,000, exclusive of those attending the day school. Additions and extensions have from time to time been made to the main buildings, and last year the West London School of Art, which was about to be closed by its committee in consequence of the small number of students attending, was taken over by the Polytechnic. The result of their enterprising effort was that within twelve months the school was attended by a larger number of students than any other school of art in the metropolis, and at the present time there are nearly 600 art students attending the various classes every week.

Mr. Hogg soon extended his interest to young women as well as to young men, and opened the young women's branch of the Polytechnic in Langham place. At first accommodation was provided for a membership of over 500. The demand, however, grew so rapidly that as far as possible the adjoining premises were secured, and at the present

time there are over 1,200 active members of this most useful and flourishing branch. It is open every evening from 6 to 10 o'clock (Sundays and bank holidays excepted). The age limit is from 16 to 25 years. The subscription is 1*s.* 6*d.* (37 cents) per quarter, or 5*s.* ($1.22) per annum, payable in advance. A large number of suitable classes are held for young women only. These include instruction in ambulance corps work, arithmetic, commercial correspondence, bookkeeping, modern languages, stenography, typewriting, dressmaking, mantle making, millinery, plain and art needlework, cooking, music, and the elementary branches. The tuition fees are exceedingly low for each course, an average difference of 1*s.* 6*d.* (37 cents) more being charged young women not members of the institute.

The following list of the numbers of young women who joined the classes during the present session is an evidence of the manner in which the classes are attended:

ATTENDANCE OF THE POLYTECHNIC (WOMEN'S BRANCH).

Subject.	Pupils.
Bookkeeping, arithmetic, and other commercial subjects	108
French, German, and typewriting and shorthand	163
Ambulance work and nursing	104
Chemistry and other science subjects	115
Civil service classes	66
Singing	146
Instrumental music	196
Dressmaking	87
Cookery	73
Elocution	124
Total	1,182

Membership entitles to the use of the reading, writing, sewing rooms, and parlors, and covers the right to attend concerts, lectures, and entertainments in the great hall of the Polytechnic at members' rates. The swimming bath is reserved for their use on several evenings; they have instruction in physical culture, and admission, at membership rates, to all ordinary Polytechnic classes. The moral and religious atmosphere is the same.

The membership of the institute is recruited principally from the various houses of business and workshops in the district, while many of the members are the sisters and sweethearts of the young men attending the Polytechnic. To provide for the social and recreative requirements of the members the committee has provided a gymnasium, one of the first of its kind, which is largely attended. The exercises are performed to musical accompaniment; they form a very pleasant and beneficial pastime to those who take part in the exercises, and are very pleasing and entertaining to those girls who prefer to remain spectators. Lawn tennis and other out door recreation is provided as far as possible, and during the summer on Saturday afternoons short excursions are organized, in which many participate to the general

advantage of their health. Entertainments and lectures of an interesting character are given every week, and prove most successful in drawing large numbers to the place. Working parties are also organized, the work accomplished being sold for the benefit of the institute, for assisting poorer members, for foreign mission work, etc. At the present time a working party is meeting and working for a bazaar, the proceeds of which are to be divided equally between mission work amongst women in China and assisting poorer members to obtain a week's or fortnight's holiday in the country during the summer, or after periods of sickness.

The number of members contributing in one way or another amounts to nearly 400. The success of this branch of the Polytechnic has encouraged the formation of many similar efforts, and the numbers of young women who join is an evidence of the need that exists for such work. Eighty per cent. of the girls who join as members are engaged either in workrooms or the business houses of the western district of London. It will thus be seen that provision is made for a very needy class of girls, and they respond in such numbers that there are always large numbers waiting for vacancies. Difficult as it is to provide sufficient attractions to keep the girls constantly in attendance the committee has overcome this difficulty and the institute is very largely attended each evening. Among the most successful agencies lately adopted in the social work of the Polytechnic are the arrangements made for excursions during the summer. In this matter the committee struck upon another quite original vein. In organizing these excursions the committee makes provision for members and others in various stations of life and endeavors to supply the wants of each section of the little community that gathers together at the institution.

Thus, for instance, a large number are quite unable to pay anything at all, and if it were not for the arrangements of the Polytechnic would have no holiday at all; for such a special subscription list is opened and donations are solicited by members, and this year over 500 by these means obtained a holiday and a rest at the seaside, who otherwise would have been utterly unable to pay the necessary expenses connected with such an excursion. Then some are able to pay only a limited amount. For such a large house on the sea front at Hastings was taken for the young women, and a similar residence at Clacton-on-Sea for young men, the latter having a fine cricket and tennis ground attached. The young women by paying 15*s*. ($3.65), and the young men 18*s*. ($4.38), were entitled to a week's board and lodging free. Each house accommodated from 30 to 40 visitors each week, and during the whole season every bed was occupied.

Another excursion for those able to afford a little more was organized to Scotland, and this proved one of the most unique efforts of the committee in this direction. Special terms were made with the railway company whereby the fare, which is £3 5*s*. ($15.82), was reduced to

25*s*. ($6.08). A large building situated in grounds of its own near Edinburgh was secured and parties were taken each week. The total amount charged for return journey, board, and lodging was only £2 7*s*. 6*d*. ($11.56), or considerably below the ordinary railway fare alone. Special excursions to the Highlands and different parts of Scotland were organized, a programme being arranged for each day. For these a special train was placed at the disposal of the party, and the various excursions were thus made at less than half the ordinary fares and with a great saving of time in travelling. So great was the demand by members and others to take part in these excursions that the committee was not able to accommodate one-half the number, though in all about 2,500 persons availed themselves of the special facilities.

A continental excursion was arranged for those members able to obtain a fortnight or three weeks' holiday. The tour comprised visits to Belgium, Germany, and Switzerland, and included some interesting Alpine climbing. The total charge for the whole journey, including hotel expenses for the three weeks, did not exceed what usually has to be paid for the railway fare alone. Each party that went was under the guidance of one of the teachers on the staff, who had previously taken the journey, and who helped to make the tour alike instructive and interesting, with a result altogether satisfactory.

Another and more elaborate excursion arranged was that to Madeira, via Lisbon, a sea voyage of about 1,700 miles each way by the magnificent vessels belonging to the Castle and Union lines. These excursions were most unique, and, like the preceding ones, the first of their kind. In all five parties went. The voyage occupied going and returning about 22 days, including a stay of nine days on the island of Madeira, where most admirable accommodations had been secured at one of the best hotels, from whence parties made daily excursions to the various places of interest.

The result of these holiday arrangements has been to draw into touch with the work of the Polytechnic a very large number of the very class of men that it desires to influence. The magnitude of the effort may be somewhat gauged when we mention that nearly 4,000 persons availed themselves of these holiday arrangements. These and other social efforts are the means adopted with such success to attract the young people of both sexes.

The educational effort has considerably expanded since the period of its commencement. The educational departments are mainly intended for those who labor during the day and desire to acquire further knowledge, general or special, in their evening hours. There are, however, school facilities during the daytime, for boys of the middle classes from whose tuition fees a considerable revenue is derived contributory to the maintenance of the institution.

Special courses and lectures during the day are also open at low prices to the general public. Membership is restricted to young men

from 16 to 25, none being admitted over the greater age, though none are debarred from the general educational advantages. The present number of active members is 3,500. The annual membership fee is 12*s*. ($2.92) if paid quarterly and 10½*s*. ($2.56) if paid in advance. Besides the widest possible range of recreative features, both indoor and out, a superior gymnasium with competent instruction in physical culture, swimming bath facilities, musical instruction of every kind and grade, military drill, and society affiliations for both edification and amusement, as well as in relation to the various crafts, trades, and professional occupations, are maintained, and on grand scales.

The system of instruction comprises six principal lines under which classes are formed, viz., science, technology, practical workshop instruction, general and commercial instruction, art and design, and music.

The courses are purely elective. The science classes include chemistry, geometry, general mathematics, general mechanics, building construction, machinery construction, geology, botany, physiology, mineralogy, steam, electricity, etc.; there being constantly as many as four or five different classes in some of these subjects.

The technical classes cover subjects that are comprised in the educational schedule of the city and guilds institute (which grants subsidies thereon under certain conditions) and include among those in which advanced and theoretical instruction is given carpentry, cabinetmaking, carriage building, brick and mason work, plumbing, boot making, metal plate work, tool making, engraving, mechanical engineering, electrical work, printing, photography, lithography, watchmaking, chemical manufacture, surveying, etc.

The practical workshop classes, nearly all of which are restricted to young men already engaged in the trades (in deference to the tenets of the trade unions and the regulations of the city and guilds institute), embrace carpentry and cabinet work, staircase building, brickwork and masonry, machine and lathe work, wood carving, patternmaking, painting and gilding, plumbing, watchmaking, brass finishing, upholstery, boot making, tailoring, etc. A large part of the plant in use, including some of the principal machinery, has been made in the workshops.

The general and commercial classes extend to all such subjects as arithmetic, bookkeeping, grammar, penmanship, stenography, typewriting, elocution, and the modern languages, with special classes for civil service, naval, pharmaceutical, and other examinations.

The art and design classes include instruction in free-hand and model drawing; perspective and geometrical drawing from the antique; modelling from copy or original designs, in clay, wax, and plaster; architecture, and the principles and practice of design, with their technical applications to carving in wood and stone; etching, chasing, and repoussé for workers in gold, silver, steel, brass, and pottery, and in patterning for textile fabrics, wall papers, etc.; and all other decorative and illuminative art.

The classes in music cover the entire range of vocal and instrumental instruction. The members of the classes being in large part those who are engaged in full daily occupations, the hours and evenings are regulated in recognition of this fact, that overstrain may be avoided. The instructors in all classes are men and women of thoroughly practical as well as theoretical knowledge.

The day school is designed to meet the needs of younger pupils of the middle rather than the working class (the distinction being somewhat sharply defined in Great Britain) and comprises both elementary and advanced departments. It imparts instruction in technical and commercial lines, as well as preparation for collegiate or professional courses, or civil service examinations.

The evening class fees are about 4*s*. (97 cents) per session for each study to members and about 6*s*. ($1.46) to others.

The instruction is regulated with the purpose of educating rather than that of grant earning, and, in order to do this, the system of manual instruction has been extended to as many trades as possible. The engineers' shop is fitted for the accommodation of about 30 students at one time. The week's instruction is divided among three sets of students, each coming for two evenings; consequently each student has about 6 hours' workshop instruction every week. Work of a very advanced character is done in the classes, one of the best pieces being a 10-horse power marine engine, with which the Polytechnic obtained the first prize and gold medal at the technical schools' exhibition. Dynamos, lathes, and nearly all the machinery required in the shop, including a planing and shaping machine, are now made by the students. In the carpenters' shop window sashes of a complicated character, circular headed doors, and handrail and staircase work are what the students principally apply themselves to. Here as in the engineers' shop every branch is taken, and the highest eulogiums have been passed upon the character of the work produced, which is certainly far in advance of that done in any other class either in England or on the continent. The watchmakers' shop is fitted as an ordinary shop with all the trade appliances and apparatus, and the work done in this department is of a character as satisfactory as that in other manual sections. The first prize silver medal of the coöperative exhibition was awarded to this class for its exhibits.

The plumbing class, which was the very first of its character, is full every season. At the present time there are over 150 students attending. The class meets three times each week; on two evenings lectures are given, and, although a syllabus for the session, which lasts seven months, is drawn up and followed out as far as possible, nevertheless every opportunity is taken of instructing pupils in the very latest developments of sanitary engineering. There are three instructors for this class, two of whom are foremen in one of the largest and best sanitary firms in London, and the third is an old student of the class, now a *master plumber*

Practical workshop instruction is also given in connection with the classes in bricklaying, tailor's cutting, metal plate work, wood carving, electrical work, and cabinetmaking.

As previously stated no effort is made in these classes merely to teach a trade, every endeavor being directed to supplement an ordinary workshop training. This practical work, being more or less of an elaborate and experimental character, is by far the most expensive section of the teaching departments. For instance, arithmetic, bookkeeping, and such subjects are taught at the rate of about 1*d.* (2 cents) per hour per student; shorthand and French, 2½*d.* (5 cents) per hour; German, 3½*d.* (7 cents); Spanish 4*d.* (8 cents); but workshop instruction at the Polytechnic averages about 1*s.* 6*d.* (37 cents) per hour per student, counting cost of materials, annual outlay in tools, apparatus, machinery, etc. This rate is considerably below that of the Finsbury Technical College, where far less manual instruction is given. The total cost of the Polytechnic work, including the school of art, the girls' branch, the day schools, and the religious, social, and educational work at the main institution, amounts to about £25,000 ($121,662.50) per annum. Of this amount about £17,000 ($82,730.50) is contributed by students and members themselves in class fees, subscriptions, etc., while the balance has hitherto been paid annually by Mr. Quintin Hogg. The work has, however, so commended itself to the charity commissioners that they have drawn up a scheme in which they are seeking the sanction of parliament to grant an endowment of £3,500 ($17,032.75) per annum to the Polytechnic. An additional endowment of £1,000 ($4,866.50) per annum is also secured upon certain funds that have been contributed by the public to the work. It is hoped that within the next six months the commissioners' scheme will be adopted, and thus a total endowment of £4,500 ($21,899.25) will be insured. An effort is also being made to obtain a grant from the London county council to make up the balance required.

The moral and religious atmosphere which pervades the institution, while nowhere obtrusive or intrusive, is felt, and even the athletics are conducted in a way to promote "muscular Christianity" rather than any love for pugilism or mere brute force.

By careful regard to the needs of the apprentices and laboring young men of the various handicrafts, by evening teaching, workshop facilities, and superior instruction, short hours and convenient arrangement of classes, restriction of ages and membership to those engaged in the trades, the Polytechnic has secured the cordial coöperation and support of both the trade unions and the guilds, and its hold upon the class it especially desires to benefit is thereby greatly strengthened. At the same time, by making a fair, though a very low, charge for the instruction imparted and advantages given, the self-dependence and manliness of the individual are encouraged and a greater interest in the work is stimulated. The restrictions imposed by the science and art department, the charity commissioners, and the city

and guilds institute, covering schedules of instruction and successful attainments, age of members, night classes, trade relations, and fees, are all believed to be essential and beneficent, at least for this particular class of the British population. The Polytechnic is the accepted model of all new institutions of its character in Great Britain, and most of its features might seemingly be wisely adopted in any similar undertaking in any part of the world.

THE PEOPLE'S PALACE.

Beaumont Institute, or the People's Palace, Mile End road, London, E., was founded by John B. Beaumont about 1840, and was reëstablished in 1887. The management is vested in trustees. There is accommodation for 500 day and 5,000 evening students, 4,360 (360 day and 4,000 evening students) being in attendance. The age of admission is 12 years and upward. There are classes for instruction in a variety of educational and technical subjects, including practical trades, tailor's cutting, upholstery, cabinetmaking, plumbing, carpentry, wood carving, photography, etching, etc., boot and shoe making, mechanical and electrical engineering, masonry, and kindred subjects. There are also educational, science, art, design, and music classes, and special classes for females in plain needlework, garment making, dressmaking, millinery, and cookery. Other subjects, such as watchmaking, bricklaying, and the like, are in contemplation. The fees are moderate; the day students pay 6*d.* (12 cents) a week, evening students from 1*s.* to 15*s.* (24 cents to $3.65) per quarter or session, according to the subjects taken. The work receives encouragement by means of prizes, certificates, etc., from the science and art department, the society of arts, city guilds, and the trustees. There are 325 scholarships in the day school, giving free education to public elementary school boys whose parents are in receipt of less than £200 ($973.30) a year. For instruction in scientific and technical subjects there are well appointed laboratories and workshops. The premises and appliances cost about £25,000 ($121,662.50), the gift of the Drapers' Company. There are endowments of £350 ($1,703.28) from the Beaumont trust fund, £4,000 ($19,466) (for ten years) from the Drapers' Company, of which £2,000 ($9,733) is funded, and this is supplemented by £2,500 ($12,166.25) a year from the charity commissioners.

The instruction given in the school workshops is not intended to take the place of a regular apprenticeship in an ordinary workshop. The object of the school workshops is to do what is often not done in the workshops of the manufacturer. In the latter the progress of the apprentice is generally very slow at the beginning, for the reason that there is no one whose special business it is to teach him and also because, the apprentice not being able to use his tools, his employer does not care to give him material to work upon for fear of having it spoiled.

Consequently the apprentice is often made an errand boy or a common laborer until, after the lapse of a considerable time and the surmounting of many difficulties, he is able to handle his tools with some profit to his employer; he is then entrusted with work upon which he can really learn his trade.

Now, in the school workshop, the pupil goes through a systematic course of instruction. The tools to be used are described, and the principles of their action fully explained. The nature and properties of the materials upon which he is to work are also pointed out. The pupil then works out a graduated set of exercises, being always under a skilled instructor who describes how each exercise is to be done, and how the tools are to be held and used, so as to get the best result. Obviously, the pupil taught in this systematic fashion in a school shop possesses immense advantages over an ordinary apprentice.

It is deserving of mention that the pupils in the workshop of this school are required to make all articles, however simple or common, to definite and exact dimensions, from working drawings, which are generally executed by the pupils themselves. No slipshod methods or hap-hazard results are tolerated; and the shop exercises, therefore, become an excellent means of discipline.

The work of this very remarkable institution, while dealing largely with a less active and perhaps somewhat less intelligent membership, is excellent, and ranks only second to that of its model, the Polytechnic in Regent street. What Mr. Hogg and his associates have been doing for the Polytechnic, Sir Edmund Hay Currie and his coadjutors have done for the East End of London. The building and its contemplated facilities are still incomplete.

ROYAL VICTORIA HALL SCIENCE CLASSES.

The Royal Victoria Hall science classes, Waterloo road, London, S. E., were established in 1885. The purpose is to supply, by means of evening classes at fees within reach of workingmen, more detailed and systematic instruction than is furnished by the popular lectures of the institution, especially in such branches of science as are likely to have useful technical application. The number of students last session increased to 192. The science and technical classes are open to artisans and practical men. The entrance fee is 1*s.* (24 cents); the class fee, 1*s.* 6*d.* (37 cents).

The Tuesday penny science lectures have become very popular, the average attendance being over 500. The programme of the past session was singularly varied and appropriate, while the takings at the door amounted to £1,825 15*s.* 7*d.* ($8,885.15). This institution is now to be absorbed by and continued as an annex to the Elephant and Castle Institute at South London.

LAMBETH POLYTECHNIC.

Lambeth Polytechnic, Westminster Bridge road, London, S., was established by Rev. Freeman Wills, and was opened in June 1888 by Princess Louise. The building had been famous as a great swimming bath establishment, and was afterwards converted into a vast lecture and concert room, equally famous for its temperance meetings, social assemblies, etc. Erected at a cost of £28,000 ($136,262), it proved a financial failure. It opened as a polytechnic with a membership of 3,000 boys. Its primary features were rather social and recreative than educational. Later its classes in science and art have made it the recipient of certain concessions from the government on those lines. It was opened with the hope on the part of its founders that it would be accepted as one of the three great institutions of technical education which the charity commissioners proposed to considerably endow in South London, if further equal endowments were provided by friends of such institutions. It is not probable that it will be so accepted. It has labored under the disadvantage of lack of funds. Without any permanent endowment, and in the presence of three other strongly endowed institutes of like character in the same part of London, it has an apparently uncertain future unless it shall find able and devoted friends. It has been conducted largely on the lines of the People's Palace, and its membership and tuition fees are practically the same.

Under the proposals made in 1888 by the charity commissioners to endow three polytechnic institutes on the south side of the Thames, one for Southwest London on the north side of the river, and four in North London, on condition that equal sums to those offered, viz., £150,000 ($729,975) for South London, £50,000 ($243,325) for Southwest London, and £200,000 ($973,300) for North London, shall be raised to the same end, great activity has been stimulated and it appears well nigh certain that all of the proposals will be met.

The first of these is likely to be the—

GOLDSMITHS' COMPANY INSTITUTE.

This institute, otherwise known as the New Cross Institute, is located at New Cross, Deptford, London, S. E., and is the most eastern of the South London polytechnics. Deptford is bounded by the parishes of Greenwich, Lewisham, Peckham, and Rotherhithe, and this section has a population of nearly a quarter of a million.

The Goldsmiths' Company have purchased the site (7 acres), until recently occupied by the Royal Naval School, and will establish and maintain the institute at a first cost of about £45,000 ($218,992.50) and a subsequent annual expenditure of £5,000 ($24,332.50) out of their corporate funds. The work of preparing the buildings and organizing

the institute has been in progress during the past year, and the buildings will soon be opened to the public.

The charity commissioners at once duplicated the company's gift, and the company will no doubt stand sponsor for its future. It will be conducted on the lines of the Regent street institute.

ELEPHANT AND CASTLE INSTITUTE.

The central polytechnic of the South London group will be known as the Elephant and Castle Institute, Borough road, London, S. It will have as an annex, as already mentioned, the great Royal Victoria Hall, at Waterloo road, S. E., purchased in August 1888, by a citizens' association, for the purpose of a people's palace, as a tribute to the memory of the late Samuel Morley, M. P., and will carry on the work hitherto performed by that institution, including its science classes.

The main portion of the funds for this institute have already been raised by the council of the South London Polytechnic Institute, though funds to complete it are still required. The Borough Road Training College has been secured, and the necessary alterations and suitable fittings will be supplied at a cost of about £15,000 ($72,997.50), as nearly as practicable. Toward this sum the council still require £10,000 ($48,665). Subject to the sanction of parliament the charity commissioners have agreed to provide an endowment of £2,500 ($12,166.25) a year, and it is hoped that an additional endowment of £1,800 ($8,759.70) a year will be secured from other sources. The institute will follow the lines of the Regent street Polytechnic.

BATTERSEA INSTITUTE.

The Albert Palace and grounds at Battersea park, London, S. W., is the probable site of Battersea Institute, and was long known as a pleasure resort of Southwest London. Being in the hands of a receiver and capable of easy adaptation for the desired ends this site has apparently been chosen, in preference to the Lambeth Polytechnic of Mr. Wills, as the location of the third school in the list, at least in so far that it appears that the charity commissioners have promised £2,500 ($12,166.25) a year as an endowment, on the condition that the council raise £60,000 ($291,990). Toward this the following sums have been promised: £20,000 ($97,330) anonymously, £10,000 ($48,665) anonymously, £10,000 ($48,665) by Mr. Frank Morrison, £1,000 ($4,866.50) by Mr. F. Nettleford, and £6,000 ($29,199) in smaller sums, leaving £13,000 ($63,264.50) still to be collected to complete the amount required.

The understanding is that the proposed institute will be upon the same plan as the Regent street and People's Palace institutes.

BIRKBECK LITERARY AND SCIENTIFIC INSTITUTION.

Birkbeck Literary and Scientific Institution, Breams Buildings, Chancery lane, London, E. C., was founded by the late Dr. Birkbeck,

and was the first of its kind in London. Since its foundation in 1823 about 100,000 persons have availed themselves of its advantages, and many of its former students have distinguished themselves in art, science, and literature. The management is by committee, and there is accommodation for 6,000 students who must not be less than 15 years of age. The instruction is of very wide range, and includes mathematics, natural, applied, and mental science, ancient and modern languages, literature, grammar, elocution, history, geography, law, bookkeeping, shorthand, art, and music. The tuition fees vary from 2*s.* to £2 5*s.* (49 cents to $10.95) per term, there being four terms in each year. There is no endowment. The present income is about £6,000 ($29,199) per annum. The institution was specially founded for the purpose of providing evening education for those engaged in occupations during the day; but there is a school of art open both day and evening, in connection with which a sketching club has been formed. The lecture hall seats 1,200 persons, and lectures are delivered each Wednesday evening throughout the year. There is a library containing over 11,000 volumes, and the reading room is supplied with the principal daily and weekly newspapers. The science and art department holds examinations in twenty-five subjects; and the prizes, exhibitions, and scholarships offered for competitions are numerous and valuable. There are gymnastic societies and a cycling club. The subscriptions to the institution are, for men, 18*s.* ($4.38); for women, 12*s.* ($2.92) per annum, with a reduction after two consecutive years.

KING'S COLLEGE.

King's College, London, has a department of engineering and applied science in which courses are given in natural philosophy, chemistry, mineralogy, geology, paleontology, mining, building construction and architecture, electrical engineering, mechanical engineering, metallurgy, geometrical, architectural, engineering, mechanical, and free-hand drawing, surveying and civil engineering, and photography. Practical instruction in wood and iron work is given, especially adapted to the needs of pupils in engineers' offices.

There are summer and winter sessions of classes for evening instruction, from April to June and from October to March. The curriculum embraces a very wide range, no less than 45 subjects, or divisions of subjects, being thoroughly taught. There are theological, workshop, and civil service (three divisions) departments. The fees vary from 1 guinea ($5.11) and upward, according to subjects, to 5 guineas ($25.55) for four classes, and there are a few extras. Lads are admitted from 9 to 16 years of age. The science and art department contributes to its classes.

LONDON COLLEGE FOR MEN AND WOMEN.

London College for Men and Women, 29 Queen square, Bloomsbury, W. C., *was established* in 1853, but is now incorporated with the Work-

ing Women's College, to supply to men and women, who are occupied during the day, with a higher education than has generally been within their reach. Masters and mistresses for all special subjects teach gratuitously. There is accommodation for about 350 students. The curriculum includes arithmetic, algebra, geometry, bookkeeping, botany, English subjects, French, German, Latin, geography, geology, physiology, précis, writing, drawing, political economy, and singing. Examinations are held in July. Fees for membership are 2*s.* (49 cents) a term for one class, or 5*s.* ($1.22) a year; per class per term, 1*s.* to 4*s.* (24 to 97 cents). These united instructions are aided by the science and art department.

COLLEGE FOR WORKING WOMEN.

The College for Working Women, 7 Fitzroy street, London, W., was established in 1874, and incorporated in 1880. The management is by council. The aim of the college is, by systematic teaching given in evening classes, to supply to women occupied during the day a higher education than has been generally within their reach. The council also desire to promote mutual help and fellowship among teachers, students, and all members of the college. The curriculum includes Latin, modern languages, science, wood carving, domestic economy, botany, musical drill, and English subjects. The fees vary from 6*d.* to 4*s.* (12 to 97 cents) per term for each subject; for membership, 1*s.* (24 cents) per term; for high class cookery, 18*s.* ($4.38), and for plain cookery, 3*s.* 6*d.* (85 cents) per course; for scientific dressmaking (six lessons), £1 ($4.87); and for afternoon class for ladies, £2 ($9.73). There are lending and reference libraries, holiday guild, benefit club, penny bank, coffee and reading rooms, and social meetings. The college teachers are unpaid. There are nearly 300 students.

CITY OF LONDON COLLEGE.

City of London College, White street, Moorfields, E. C., was established in 1848 as the Metropolis Evening Classes for Young Men. The management is by a council. The purpose is to afford, by means of evening classes, instruction in various branches of literature, science, and art. There are 132 classes and 2,500 students, controlled by a staff of 40 professors. Examinations are held annually, and numerous prizes and studentships are awarded by the council, the Mitchell trustees, the Saddlers' Company and others, and there is a Lubbock scholarship of £10 ($48.67). Lectures and entertainments are given in the large hall of the college every Thursday evening, to which students are admitted free. The new building, recently erected at a cost of £16,000 ($77,864), affords accommodations for 4,000 students. There are art and cast rooms, reading and coffee rooms, a library, and an excellent laboratory. The range of subjects taught is very wide (usually from ele-

mentary to advanced) and well calculated to assist those who have opportunities and desire to improve themselves by evening study. The fees vary much, ranging from 2*s.* 6*d.* to 9*s.* (61 cents to $2.19) per term, and from 7*s.* 6*d.* to £2 2*s.* ($1.83 to $10.22) for a course. The college receives government recognition through the science and art department.

CHELSEA INSTITUTE.

The polytechnic proposed for Southwest London (north of the Thames) is made practically secure by the acceptance of the commissioners of the site offered by Earl Cadogan, valued at £10,000 ($48,665), and the probability of the absorption of the technical school, known as Onslow College, upon which negotiations are pending. Considerable progress is understood to have been made toward raising the sum of £50,000 ($243,325), which the charity board agrees to duplicate. While not yet established entities, there is no doubt that these, like the others in progress in South London, will soon be efficient technical schools.

NORTH LONDON INSTITUTES.

Mr. Albert Shaw states that the arrangements for North London have not progressed so far (January 1890) as those for South London, but committees composed of influential members of parliament, and influential citizens of the boroughs of Hackney, Finsbury, Islington, and Saint Pancras, are earnestly working for the attainment of these very desirable institutions.

It is stated on later authority that representations have been made by an influential committee, to the charity commissioners, for aid in support of the establishment of institutes in the above mentioned boroughs. It is estimated that a sum of £400,000 ($1,946,600) will be required for the completion of this proposal. Endeavors are being made to raise £200,000 ($973,300) in subscriptions. As yet no formal application has been made to the charity commissioners, but the friends of the northern institutes have effected an organization as the Northern Technical and Recreative Institute for Islington, Hornsey, and Highgate, with a highly influential board of management, including both the Prince of Wales and the lord mayor of London.

CLERKENWELL POLYTECHNIC INSTITUTE.

The Marquis of Northampton has likewise offered a site in Clerkenwell for the purposes of Clerkenwell Polytechnic Institute, provided arrangements can be carried out to his satisfaction; and in support of this movement the charity commissioners have expressed their willingness to grant aid in the establishment of an institution of the first rank and importance in this populous centre of one of the most skilled industries of the metropolis.

HUDDERSFIELD TECHNICAL SCHOOL.

One of the oldest established technical schools in England is that at Huddersfield, which was founded as a mechanics' institute in 1841. The present buildings were opened in 1884. There are four departments—a technical school, a science school, a school of art, and a mechanics' institute.

Huddersfield being one of the centres of the woollen industry a specialty is made of the textile department, where practical and theoretical instruction is given in weaving and pattern designing, cotton spinning, cloth manufacture, and dyeing.

It appears that this school approximates pretty closely to the *Fachschulen* of Germany, though there is no evidence that the English school teaches trades with Teutonic thoroughness.

BRADFORD TECHNICAL COLLEGE.

Another very important technical school is the Bradford Technical College, which consists of a day school, and a set of day and evening classes in various branches of science, art, and technology. Special attention is paid to the textile and dyeing departments, and there is a mechanical workshop, the aim of which appears to be more like that of the well known foreign apprenticeship schools than is usually the case in English institutions of the kind. The object of the school is said to be to produce skilled draughtsmen and mechanics, and it is stated that several students have obtained situations with railway and steamship companies immediately on leaving the college and without any subsequent training.

The yearly cost of maintenance is £7,000 ($34,065.50). The income from fees is £2,000 ($9,733), from grants, £1,600 ($7,786.40), from subscriptions, £2,200 ($10,706.30), and from other sources, £1,200 ($5,839.80). The number of day students is 314; the number of evening students, 1,337.

The technical training for mechanical engineers and machine makers in the different technical schools is of various degrees of thoroughness, ranging from a fairly complete theoretical and practical instruction, to mere attendance on evening classes in machine construction, theoretical and applied mechanics, etc. School officials and employers unite in disavowing any intention to organize a course of instruction having for its object to substitute such training for the present training acquired during apprenticeship. In no case do they attempt to graduate a fully trained, skilled workman. Their efforts seem to be directed toward supplementing the apprenticeship training. For this purpose the system of evening classes is more widely developed, and the day schools are correspondingly less developed. Evening classes, in short, are more favored, and it is safe to say that from three-fifths to four-fifths of technical instruction in the trade is given in this way, and in every case the majority of the students are appren-

tices already in the trade. The opinion seems to be almost universal that the trade can only be learned in the shops; that the school training makes little difference in regard to manual dexterity in the use of tools, but is, however, of decided benefit in the way of general training. In view of the foregoing objections to school shop training especial attention should be directed to a unique feature of the training existing at the Bradford Technical College, where these objections seem likely to be overcome.

In addition to the regular class of students the school receives a number of student apprentices. These student workmen are received for a term of years, are given a wage somewhat less than they would receive in a regular shop, work the entire day in the shops connected with the school, are employed in the manufacture of machines and engines to be afterwards sold, and devote somewhat less time than the regular students to the theory classes. Good returns have been received from the sale of their work, and the system seems to be meeting with success.

We subjoin some details of the instruction given in the building, construction, and textile departments of the college for the purpose of comparison with our own schools of the same kind, such as the New York Trade Schools and the weaving school of Philadelphia.

Lectures are given on the following subjects pertaining to building construction:

Materials—the nature, characteristics, qualities, and defects of the materials in general use by builders; bricks, tiles, terra cotta, pipes, and miscellaneous clay wares; granite, sandstone, limestone, and slates; limes, cements, mortars, concrete, plaster; varieties and market forms of timber; cast and wrought iron, steel, lead, zinc, and copper.

Strength of materials—resistance to tension and compression, safe working stress, limit of elasticity, dead and live loads, stresses in simple frames, etc.

Scaffolding—the various kinds of tackle and scaffolding used in ordinary construction, appliances for hoisting materials, Lewis nippers, blocks and falls, snatch blocks, sheer legs, derricks, etc.

Constructive details—surface digging and general excavations, digging trenches for foundations, drains, etc., planking and strutting to sides of excavation, brick drains and sewers, method of laying drain pipes; foundations and footings for walls under different conditions, concrete for foundations, damp proof arrangements, hollow walls, compound walls, flues and chimney shafts, various kinds of arches; formation of floors in wood, wood and iron, and concrete and iron; roofs of various forms in wood and iron; roof coverings; different forms of cast and wrought iron and built-up girders; preparation by joiner for plumber and plasterer; plasterer's work; plumbing, rain drainage of buildings, sanitary arrangements of dwelling houses, disconnections, trapping and ventilation of soil pipes and drains; internal

fittings and furnishings of buildings, doors, windows, stairs, handrails, etc.

General specifications of the labor and material required in the various branches of the building trade; measurement of materials and labor.

Three years are required for the completion of this course. But Mr. G. F. Charnock, head master in the department, complains that shop apprentices remain on an average about two years, at the end of which time, finding they can readily earn wages at least double that of those instructed in the ordinary way, they are in many cases tempted to leave, without availing themselves to the full extent of the benefits to be derived from a complete course of training. The committee have therefore decided that in future apprentices must enter into an agreement to remain three years.

The writer says, however, that gratifying reports of the progress of old students continue to be received. In more than one instance they have been placed in charge of important works, and are obtaining remarkably good salaries by reason of the special knowledge acquired in this department. He adds:

There can be no doubt that the prejudice which may have existed in the minds of those totally unacquainted with the excellent way in which the department is equipped, and of the practical nature of the training, is rapidly breaking down, although it is much to be regretted that even in the town itself the greatest ignorance on those points still prevails.

In the masters' reports for the year ending November 26, 1890, the same writer states:

A record has been kept of the situations obtained by students on leaving, and, as far as could be ascertained, of their subsequent progress. Since the opening of the college in 1883 over 90 regular students have passed through the department, and it is a matter for sincere congratulation that many of them occupy positions of responsibility, not only in this country, but in the United States, South America, and even in France and Germany, where technical instruction is generally considered to be so far advanced.

In the textile department lectures and class work of two hours' duration occupy the mornings of every Tuesday and Friday, and two hours are devoted to practical work in the shop on the same days of each week. Evening classes are also held.

The first course of instruction in this department includes a full examination of all the parts of the loom, of the different classes of looms, and their suitability for weaving different fabrics. Then follows instruction in the principles of weaving and in the arrangement of simple patterns, such as twills, stripes, etc., upon design paper; the draughting, or manner of drawing the warp threads through the healds, and the actuating the healds to weave such patterns; the production of patterns by combination; applying the patterns to fabrics suitable for them, etc.; calculations for yarns and fabrics; systems of indicat-

ing the counts of yarns in worsted, cotton, woollen, silk, etc.; the weight of folded yarn to produce a required weight; finding weight and cost of warp and weft in a fabric, etc.

The second course relates to the production and arrangement of designs for fancy goods and requiring dobbies or wytches to weave them; practical weaving at the loom of the designs produced; the Jacquard machine, double lift machines, compound harness, etc.; card cutting, weaving, and all calculations connected with the machine, and the application of the design to the fabric; double weft-faced and double warp-faced cloths, reversible ribbons, etc.; figured double cloths, etc.; triple or multiple cloths generally.

The third course includes designing for elaborate fancy goods; the production of new floral and other designs, suitable for dress goods, damasks, etc.; gauze fabrics; figured gauze; velvet and pile fabrics, plushes, corduroys, etc.; figured velvets.

A special class studies the analysis of fabrics, etc.; testing yarns for counts, strength, elasticity, twist, etc.; microscopic examination for determining structure, etc.

There are special classes also for the study of color composition, decomposition, and combination of colors; and special art classes.

In the Bradford masters' reports for 1890 the head master of the textile department, Mr. Thomas R. Ashenhurst, protests against the neglect of art study by too many of the technical students in these words:

> I must again call attention to the fact that the students neglect the art and color studies too much, and that it is a great drawback to their progress. Applications are constantly being made for students to fill positions as assistant designers, and the great difficulty in recommending them is that so very few possess even the most elementary knowledge of art. Students should not forget, as they unfortunately appear to do, that technical without art knowledge is not sufficient.

It is almost impossible to decide impartially as to the relative merits of two schools so different in general plan and purpose as the Bradford Technical College and the New York Trade Schools. As soon as one institutes a comparison between them he begins at once to appreciate the fact that there are no terms by which they can be compared. Each is excellent in its own way, and one is compelled to decline to pronounce either superior to the other. At Bradford, for example, the course of instruction in the building construction department occupies three years; in the New York school, five months. On the other hand in the New York school the pupil devotes his whole time, every day, to class room and shop work; at Bradford four hours a week are spent in the lecture room and shop practice.

Whether the first system is better than the other is a question of fact which can not be settled off-hand. But conceding that the longer continued technological training of the English school is more extensive and more thorough than our own, it is yet an open question

whether a full three years' course would or could be pursued by young artisans in this country. If made obligatory would not many be excluded from the benefits of a protracted course of training who now profit greatly by the more limited advantages at their command?

In the textile department of the Philadelphia School of Industrial Art we have a school very similar in design and comprehensiveness to that of the Bradford Technical College. From the description of the Philadelphia institution, given elsewhere, it is safe to assume that no British technical school is better equipped, or able to impart a higher grade of instruction. The students can not be charged with neglect of color and art studies, for these branches are made specially prominent in the Philadelphia school.

MANCHESTER TECHNICAL SCHOOL.

The impetus given to technical education by the report of the British royal commissioners in 1884 was felt nowhere in England more powerfully than at Manchester, the great industrial centre of the United Kingdom.

The Manchester Technical School—soon to be merged in the Manchester Whitworth Institute—ranks among the foremost of its class in the number of students in attendance and in the wide range of its instruction. The number of individual students, according to the report of 1890, was 3,532, a large proportion of whom were enrolled in more than one class.

The work of the school is divided into day and evening schools. The day school is for boys and affords instruction of a similar character to that given at the Bradford school.

In the evening a very comprehensive course of technical classes are conducted, and the number of students who are presented for the annual examinations, held by the City and Guilds of London Institute for the advancement of technical education, exceeds that of any other provincial school or college. The school is managed upon very popular lines, and in the evening large numbers of young artisans are attracted to the various courses of lectures, many of the courses being accompanied by practical instruction. Although the school has been at work for only seven years a new era is about to open for it. The Whitworth legatees have devoted the sum of £43,000 ($209,259.50) toward extending the movement, and a further £13,000 ($63,264.50) has been granted for the same object from the profits of the Manchester exhibition; consequently, as in many other provincial towns, the work is making great progress, and in the course of another two years will be considerably in advance of its present position.

The students' fees for the year ending July 31, 1890, amounted to £4,300 17*s.* ($20,930.09); grants to the school, £1,363 2*s.* ($6,633.53); total receipts, donations, etc., £8,199 3*s.* 11*d.* ($39,901.39); total disbursements, £11,790 5*s.* 5*d.* ($57,377.35). So that, prosperous as the

school was in other respects, it had, at the end of its fiscal year, a deficit of £3,591 1*s.* 6*d.* ($17,475.96).

The success of this school has been chronicled with sufficient particularity and minuteness. It is of equal importance to note what experience shows to be an element of weakness in the conduct of its educational scheme. And yet the faults to which we refer are not inherent in the system of technical education itself; they are chargeable rather to deficiencies in preliminary training on the part of the students, and to the absence of coördination between the curricula of the lower and higher grades of schools.

At the opening of the session of the Manchester Technical School, in September 1890, Mr. J. R. Barlow made an address to the students in the department of spinning and weaving, in the course of which he found occasion to say:

In our new found zeal for technical instruction we must not forget the immense importance of a good, all-round education as a foundation for the later superstructure of specialized study. The students in our technical schools are constantly handicapped by the deficiencies in their earlier training.

More emphatic and more specific is the language used by Mr. Ivan Levinstein, before the classes of the chemistry, dyeing, and printing departments of the same institution, on September 19, 1890:

There is no graver error, in my opinion, than to specialize at too early an age, and before the mind and mental faculties have been generally developed. My experience as a rule has been that the best and foremost specialists, in any scientific and technical subject, have always been those who, in their earlier years, have had a liberal and sound education, and who only commenced the study of special subjects at a more mature age. Just as the man, who has acquired a knowledge of the scientific principles underlying a certain art or manufacture, will more readily and easily master his art than the one who is not possessed of this prior knowledge, almost as much will the youth, with a sound preparatory mental training, have the advantage in acquiring special scientific and technical knowledge over the one who is deficient in that respect.

It is, however, a regrettable fact that a number of students entering our technical schools are insufficiently prepared for taking up the study of special technical subjects.

Further on, Mr. Levinstein is outspoken in his opposition to the plan of crowding a great variety of studies into a technical course. He says:

It can not possibly serve any good purpose that promoters and managers of technical schools should follow the unfortunate plan of comprising within their scheme of teaching almost as many technical and scientific subjects as one can find names for in a comprehensive dictionary. Instruction of the very best kind in a few leading subjects, bearing specially on the industries largely represented in the locality in which the school is established, will be a thousand times more useful and valuable than the cramming of multifarious subjects into the heads of students, probably for the sole purpose of catching the public ravor,

and getting grants from the science and art department, or other available sources.

There can be no doubt, however, that the Manchester Technical School is well equipped for its special work. Its students have access to a scientific and technical library for reference and home study, as well as to a collection of raw and manufactured products, apparatus, and models illustrative of the subjects taught in the school. The laboratories are suitably furnished for the practical study of chemistry, metallurgy, calico printing, dyeing, and bleaching; the engineering workshops are well supplied with all needful tools and appliances connected with mechanical engineering and building construction.

The textile industries department is supplied with a complete range of spinning and preparation machinery, and with upwards of forty hand and power looms for weaving the chief varieties of cotton, silk and woollen goods. It also includes a library of reference books, and a museum, in which is displayed a series of models illustrative of the development of the loom, and of the various appliances used in the manufacture of cotton goods, as well as specimens of the chief textile fibres, showing the processes of their conversion into yarn and cloth. The students may thus gain, in the workshops and laboratories, a practical knowledge of the processes connected with the chief industries which are the subject of the theoretical instruction imparted in the class rooms.

TECHNICAL SCHOOL OF MESSRS. MATHER & PLATT.

An unpretending but very useful science and technical school was established in 1873 by the Messrs. Mather and Platt, proprietors of the Salford iron works, for the purpose of enabling their apprentices to "study sciences allied to their trade," as the prospectus for the session of 1890–'91 briefly puts it. The firm requires all the apprentices to attend the classes as a condition of their employment in the works, so that each handicraft may be acquired at the same time as the technical knowledge necessary to it.

The subjects taught are applied mechanics, steam and the steam engine, engineering, metal working, mathematics, electric lighting, machine drawing, machine construction and drawing, building construction, plane and solid geometry. Certificates are awarded by the firm to meritorious students, and prizes for systematic industry, punctuality, and excellence of work are also offered.

Dr. W. T. Barnard, in his work on Technical Education, writing in 1886 alludes to this school as follows:

I know of but one English school where any consistent efforts are made to apply school instruction in the shops—that of Mather and Platt, Manchester, whose teachers are employed in the shops, and personally direct the theoretical instruction of their pupils to shop work.

LIVERPOOL SCHOOL OF SCIENCE AND TECHNOLOGY.

The Liverpool School of Science and Technology was instituted in 1861 for the purpose of promoting a knowledge of science and art and the application thereof to the various industries.

At present the courses of instruction in this school apply to the following trades or industries: Mechanical engineering; electrical engineering; industries involving applications of chemistry; the building trades; carpentry and joinery; plumbing; brickwork and masonry; lithography; quantities; land surveying. Classes in these studies are intended for persons of either sex who wish to receive a scientific and practical preparatory knowledge for intermediate posts in industrial works. It is designed also for apprentices, foremen, journeymen, and others, who desire to receive instruction in the theory and principles of science connected with their occupation during the daytime; and for pupils from middle class and other schools who are preparing for the higher scientific and technical courses of instruction pursued at university and technical colleges.

The school is supported in part by government grants, which are paid on behalf of students who fulfil certain conditions prescribed by law. Students' fees vary in amount according to the nature of the studies pursued and the number of classes attended. The school is in connection with the science and art department of South Kensington.

MERCHANT VENTURERS' SCHOOL, BRISTOL.

At Bristol, one of the chief centres of the English boot and shoe industry, there has been established a trade school under the name of the Merchant Venturers' School, in which classes in machine drawing, metal working, plumbing, carpentry and joinery, and boot and shoe making are taught. Specimens of the work done in each department of the school were exhibited in the hall of the school in the autumn of 1890, and, judging from the descriptive catalogue of these specimens, the display was highly creditable to both teachers and pupils. While this school is constructed on a smaller scale than the technical schools of Bradford and Manchester, it is apparently successful in stimulating and sustaining an interest in industrial education among the working people of the city. Under its present management this school has absorbed the old trade and mining school founded at Bristol by Canon Moseley.

MASON SCIENCE COLLEGE, BIRMINGHAM.

One of the most notable of the science colleges is the Mason Science College, which Birmingham owes to the munificence of Sir Josiah Mason. This college was opened in October 1880. It was established to provide instruction in theoretical and applied science. The building is said to be the most complete in its arrangements and fittings of any

scientific institution either in England or on the continent. The building itself cost £60,000 ($291,990), and in addition to this sum the founder gave £110,000 ($535,315) towards the endowment fund.

SHEFFIELD TECHNICAL SCHOOL.

In the technical school at Sheffield special prominence is given to instruction in metallurgy and engineering. Although the chief industry of the district occupies the central position in the course of instruction other branches of local manufactures are not neglected, but are specialized into separate courses, dealing with metals (other than iron and steel) used in the arts. Students are thus enabled to select and at once enter upon a course of scientific metallurgical training of immediate practical utility. There are both day and evening classes. The subjects of study in the department of metallurgy include mathematics, physics, chemistry, geology and mineralogy, machine drawing, metallurgical laboratory work, applied mechanics, etc. Fees for the full course amount to 18 guineas ($91.98) per year for each of the three years over which the pupilage extends. But any student may elect to take a partial course at pleasure, though certificates are granted only to such as follow the prescribed courses and pass the regular examinations.

The equipment of this department is excellent. A small steel works plant has been erected, including melting holes, pot house, and pot making tools, malleable iron furnace, etc. An iron foundery and a 25-cwt. open hearth furnace, complete with three systems of gas producing (viz., ordinary, oil, and water gases), are now being built. The laboratory has been equipped with the most modern apparatus for metallurgical analysis, more especially with appliances for the rapid and accurate chemical examination of iron, steel, fuel, and refractory materials. A 50-ton testing machine (the most perfect yet constructed), complete with tensile, torsion, crushing, and transverse gearing, has also been purchased. These additions render the school the most complete in existence for teaching the practical manufacture, the chemical constitution, and the physical properties of steel.

In the engineering department the course of study also extends over three years. Students attend classes and lectures, and perform experimental work in the laboratories and practical work in the drawing office and workshops. The subjects embraced in the course are mathematics, physics, mechanics, strength of materials, principles of construction, design of structures in wood and iron, steam and gas engines, steam boilers, machine and engine design, mill work, workshop tools and appliances, hydraulics and hydraulic machinery, pneumatics, and compressed air machinery. The laboratory is fitted up with engines, dynamometers, pyrometers, draught gauges, etc., and the machine, wood work, and smith's shops are supplied with all necessary tools for rendering complete and thorough the instruction given.

The lectures on mathematics, physics, and chemistry are given at

Firth College for the benefit of students in this department, as well as those in the department of metallurgy; the remaining subjects are taken at the school.

A fee of 10*s.* ($2.43) admits the student to all the evening lectures for the session; or half of that sum for one subject, and 2*s.* 6*d.* (61 cents) for each additional subject.

Classes are held for the study of mathematics, drawing, sound, light and heat, electricity and magnetism, chemistry, engineering, applied mechanics, plumbing, carpentry and joinery, photography, typewriting, shorthand, etc.

YORKSHIRE COLLEGE, LEEDS.

The Yorkshire College at Leeds was founded in 1874 under the name of the Yorkshire College of Science. In 1887 it became one of the three constituent colleges of the Victoria University, the other two being Owens College, Manchester, and University College, Liverpool.

The Yorkshire College offers the usual courses of academical study; but it has, in addition, a department of science, technology, and arts, one object of the college being in particular to provide instruction in such sciences and arts as are applicable or ancillary to the manufacturing, mining, engineering, and agricultural industries of the county of York. Accordingly we find that special attention is given to the chemistry and geology of coal mining, and that mining engineering, colliery management, and underground surveying hold important places in the technological curriculum.

The course of instruction in the theory and practice of coal mining indicates the pains which are taken at this institution to give students a careful and complete preparation for pursuing the principal industry of the district. The course includes the discovery and preliminary explorations of a coal field, boring by hand, levels, inclines, shafts, shaft sinking, how to lay out a pit, tunnels, cross-measure drifts, etc.; ventilation, principles and practice; ventilation by furnace and by machines; fire-damp, black-damp; fresh, salt, and acid water; temperature, spontaneous combustion; rules for the safety and economy of mines; safety lamps; surface works; screens, pit frames, safety hooks, cages, etc.; shaft sinking by machinery; methods of working coal—modifications of pillar and stall and longwall, midland counties, northern counties, Lancashire, North and South Wales, France, Germany, and America.

Class work in the department of textile industries is equally important, and of like thoroughness. From the report of this department for the year 1889–'90 it appears that the number of students taking the course of textile instruction during the session was 131. It is unnecessary to give a statement in detail of the scheme of study, since it is substantially the same as that pursued in all weaving and spinning schools of high grade. As one result of the technical teaching in this department the report states that "during recent years there has

been established in Leeds, and the immediate locality, a trade in figured mantlings, which undoubtedly owes its origin, and, in some measure, its development, to the operations of the college textile classes."

In the dyeing classes the number of students for the year was 44. The course of teaching in this specialty is of a scientific character, conjoined with practice in the art.

Prof. J. J. Hummell, who has charge of this department, says in the report that great attention has been paid to cotton dyeing, in consequence of the largely increased number of the so-called Congo colors derived from coal tar, a class of coloring matter specially applicable to cotton and rapidly growing in importance. During the progress of the work new facts have been discovered, which are of practical importance in connection with the application of these as well as of the older basic coloring matters.

The value of investigations of this kind, from a commercial point of view, can hardly be overestimated, since it is only by means of original researches, conducted by those who are acquainted with what has already been achieved in the complex art of dyeing, that further improvements can be made.

The professor takes pride in referring to the success of students who have been under his instruction. He says:

It is pleasing to learn that our students continue to gain appointments. Indeed, I have now more applications than I can meet for young men to assume the management of dyeing operations in manufactories of various kinds. * * * Since the issue of the last report one student has undertaken the direction of the dyeing department in an important hosiery manufactory in Leicester; another occupies a similar position in one of the Perth dye-works; a third (an evening student) has been appointed to a like position in a Bombay works; and a fourth is engaged in one of the carpet works of Kidderminster.

The departments of dyeing and of textile industries in Yorkshire College are maintained by the Worshipful Company of Clothworkers of the city of London, at an annual cost of £1,800 ($8,759.70). This company also made the original grant of £30,000 ($145,995) for the building and equipment of the department which it now supports.

DURHAM COLLEGE OF SCIENCE.

The Durham College of Science at Newcastle-upon-Tyne has a technical department in which provision is made for courses of instruction in technical chemistry, mining, mechanical, marine, and electrical engineering, naval architecture, metallurgy, and chemical manufacture.

Lectures, and recitations from text books, constitute the chief means of imparting instruction. Indeed, the authorities of the college explicitly disclaim any purpose of trade teaching, and say that opportunities will be afforded for carrying on experimental work in connection with all these departments, but no attempt will be made to supersede workshop training in the use of tools.

An apparent exception is made in the plumbing department, concerning which it is said that "in the workshops instruction will be given in all the branches of the trade, and those who attend the classes regularly will have the opportunity of competing in the practical examination conducted by the City and Guilds of London Institute."

It would seem, too, that the teaching in this case is designed to qualify the student to become an operative plumber; since attendance at the complete course of instruction, to the satisfaction of the teachers and lecturers, will be recognized by the district council for the registration of plumbers. But the workshops are open only to apprentices whose employers subscribe to the Plumbers' Technical Class Association.

It may be said here in regard to technical education as applied to plumbing, that though of comparatively recent existence in Great Britain, it seems at present to be making rapid progress, and results as far as obtainable are very favorable. The effort is being made all over the kingdom to raise the practice of plumbing to the rank of a profession, and most of the master plumbers are assuming the title of sanitary engineer. For this purpose the Worshipful Company of Plumbers, London, is providing liberally and coöperating with district associations to organize courses of instruction in connection with technical schools wherever they exist. The instruction is too recent to allow of numerous returns.

Virtually, however, there is no practical trade teaching at this college, mere lectures on electric lighting, carriage building, and kindred subjects amounting to but very little in the absence of shop work practice.

SOUTH SHIELDS PUBLIC LIBRARY CLASSES.

In the South Shields public library classes, near Newcastle, for the session of 1890-'91, there were enrolled 805 students. Of this number 226 were women whose occupations were not stated; but the trades and professions of the 579 men were as follows:

Engineers	258
Joiners	90
Teachers	89
Architects	27
Clerks	22
Chemists	15
Patternmakers	13
Masons	12
Miners	9
Naval architects	8
Blacksmiths	4
Moulders	3
Platers	3
Barmen, boilermakers, builders, engravers, grocers, house agents, plumbers, and tailors, each	2

Agricultural implement maker, baker, brass finisher, glass mould maker, glass silverer, medical student, millwright, painter, photographer, tallow chandler, each..... 1

These classes are conducted in connection with the South Kensington science and art department. Instruction is given in geometry, machine construction, mechanics, naval architecture, the principles of sound, light, heat, magnetism, electricity, chemistry, steam, drawing, painting, design, and modelling. Typewriting and shorthand are also taught, and at a small tuition fee.

A department is open to boys going to sea, in which navigation, nautical astronomy, applied mechanics, machine construction, etc., are taught.

LEEDS MECHANICS' INSTITUTION.

This institution has under its supervision and control two schools—one of art and the other of science and technology—both of which are in connection with the science and art department of South Kensington.

The school of science and technology had enrolled, in November 1889, 692 students, as against 573 in May of the same year. In this department there are various courses of instruction, including acoustics, light and heat, physiology, botany, building construction, carpentry and joinery, chemistry (organic and inorganic), engineering, gas manufacture, geology, iron and steel manufacture, machine construction and drawing, magnetism and electricity, mathematics, mechanics, physics, metallurgy, plumbing, practical, plane, and solid geometry, and steam.

The subjects of plumbing and of gas manufacture were added to the syllabus of this school during the year 1889–'90; and the report of the committee indicates that they are awake to the demands of the times and the requirements of local business. In this report they say:

> A knowledge of the sciences which underlie the trades of the district is now essential to every skilled workman, and the committee have endeavored to establish classes tending to this result.

Women are admitted to all the classes, and the teaching staff consists of thirteen specially qualified instructors.

In addition to the classes above enumerated there were also classes in French and German, in shorthand, and in dressmaking, under the same general superintendence, during the year.

HERIOT-WATT COLLEGE, EDINBURGH.

This is one of the best equipped technical schools in the United Kingdom. In the teaching staff or faculty of the technical departments of this college there are 35 professors and instructors, many of whom are distinguished for scientific attainments.

The history of this institution is full of interest and instruction.

Mr. Leonard Horner, F. R. S., a native of Edinburgh, was the founder of the School of Arts, as the institution was originally called. In March 1821 this gentleman happened to inquire of a watchmaker with whom he was conversing whether young men brought up to the trade of watchmaking received any mathematical education. The reply was to the effect that this was seldom the case, because of the expense of such instruction, and on account of the fact that the usual hours of teaching mathematical classes made attendance impossible. Mr. Horner immediately suggested a plan by which such branches as would be useful to mechanics might be taught at convenient hours and at small expense; and, with the coöperation of Dr. Brewster, afterwards Sir David Brewster, and others, the scheme was carried out.

The result was the opening of the school in October 1821. In 1824, when a movement was started to erect a suitable memorial of James Watt at Edinburgh, it was proposed to amalgamate the funds raised for this purpose with those of the School of Arts. It was not until 1851, however, that the joint committee of the school and the subscribers to the Watt fund purchased the building long occupied by the school. The name of the school then became the Watt Institution and School of Arts, under which designation it continued until 1885, when its endowment was united with that of George Heriot's hospital, and placed under the management of a new governing body. Since then the institution has borne its present title of Heriot-Watt College.

It is claimed that the original School of Arts at Edinburgh was the first institution in Great Britain founded for the express purpose of giving education in the principles of science to the industrial classes.

The summary of attendance of students in the various classes of the technical department of the Heriot-Watt College for the session of 1889–'90 shows that the whole number of class tickets issued was 2,754. In the literary and commercial department for the same year 1,735 tickets were held. The total number of individual students in both departments, however, was only 2,861, of whom 420 were females and 2,441 males. Young women were first admitted to the college classes in 1869.

There are both day and evening classes in each department of the college. The college possesses in its lectures, theaters, laboratories, and workshops every facility for preparing young men for work as merchants, manufacturers, or engineers, and for supplying in the evening such instruction as is required by those already employed in such occupations.

The college has physical, electrical, mechanical, and chemical laboratories, with all necessary apparatus for experimental work in engineering science, chemical manipulation, and analysis, as well as for practice with wood and metal working tools and in the use of electrical instruments, dynamo, motor, storage cells, etc.

The Industrial Museum of Science and Art is immediately opposite the Heriot-Watt College. It contains splendid collections of raw products and manufactured articles, with models illustrating machinery and manufacturing processes. The study of these is of great value in supplementing the instruction given at the college.

In the technical department the courses of study comprise physics and electrical engineering, theoretical mechanics, mathematics, chemistry, machine construction and drawing, civil engineering, building construction, carpentry and joinery, masonry and brickwork, plumbing, carriage building, photography, watch and clock making, typography, metal work, and wood work.

In the art department of the college, modelling, perspective, ornament, and decoration are taught.

Even in the commercial and literary department the principal attention is given to practical subjects. The full course includes history and English literature, English language and composition, French, German, Spanish, Latin and Greek, economics, commercial geography, practice of commerce, office work, bookkeeping and writing, shorthand, vocal physiology and elocution, theory of music and harmonium.

In the department of science the studies pursued are natural history, physiology, hygiene, botany, geology, physiography, and agriculture.

To illustrate the direct bearing which these various subjects have upon business and commerce we may instance the teaching of industrial geography in this institution. Lectures are given, illustrated by maps and diagrams, on the natural conditions of the earth, mineral, vegetable, and animal commodities (with specimens) and their geographical distribution. Then the means of transportation are considered—roads, railroads, canals, and ocean steamers. Trade routes and lines of telegraph of the world come in for a share of attention. The geography of the four chief trading nations—Great Britain, the United States, France, and Germany—is thoroughly taught. The regions of production, the manufacturing districts, and the trade centres of the leading commodities in the British market receive careful consideration.

For example, during the session of 1890–'91, three specific commodities were selected upon which lectures were given, viz., cotton, on the manufacture and trade in which the value of British iron and coal deposits mainly depend; tea, the changes in the producing regions of which are some of the most striking in modern commercial geography; and meat, a commodity of recent introduction from abroad which has greatly changed the position of British farming.

Attendance in the technical department increased to 3,031 during the session of 1890–'91.

In the heart of a populous city it is impossible, of course, to give instruction in practical farming; but at the Heriot-Watt College the principles of agriculture appear to be set forth with great amplification

and with considerable minuteness. The lectures are supplemented, also, by excursions on Saturdays to the very best farms in the Lothians—another custom prevailing in this institution which might be imitated with profit in similarly situated colleges at home.

The fee for tuition in most of the classes is 5 *s.* ($1.22) per session.

TECHNICAL INSTITUTE, DUNDEE.

The Technical Institute at Dundee was established in 1887 under the terms of Sir David Baxter's bequest, setting apart £20,000 ($97,330) for the foundation and endowment of an institution for the education of boys or young men in those branches of learning necessary or useful for working mechanics and other craftsmen.

The teaching staff includes fifteen instructors. The subjects taught in the different classes comprise mathematics, theoretical mechanics, sound, light, heat, magnetism and electricity, chemistry, applied mechanics, steam, mechanical engineering, electric lighting, plumbers' work, wood carving, modelling, plane and solid geometry, machine construction and drawing, carpentry and joinery, decorative art, and textile arts.

The institute has not been in operation long enough to be perfect in all its appointments; but in due time it will undoubtedly take a good rank among technical schools. The newness of the enterprise is apparent in statements like the following under the head of jute and linen manufacture:

> The weaving shed is being fitted up with a complete system of spinning and weaving machinery, and it is expected that the equipment will be in order for the session of 1890–'91.

The work of the institute, however, is already well organized in most of the departments.

There are day and evening classes in nearly all of the subjects taught in the school; and most of the classes are conducted so as to conform with the requirements of the science and art department and of the City and Guilds of London Institute. That is, the students are required to pass the annual examination instituted by the science and art department in order to earn the government grants which are bestowed only on compliance with this condition.

As the Heriot-Watt College derives great advantages from its proximity to the University of Edinburgh, so does the Technical Institute at Dundee, from its close association with Dundee University College, afford to its students unusual facilities for a liberal education; since they may avail themselves of the privilege of attending many of the college classes without charge.

In University College the technical courses comprise classes in engineering and in the chemistry of textile fabrics. The equipment of the dyeing laboratory is ample and each student is required to avail him-

self of the facilities it affords for practical work in the dye house. Attendance for two years is requisite for the completion of the course.

Students have free access to the technical museum of the college in which there is a collection of over 8,000 specimens. The object of this museum is to exhibit such characteristic and typical specimens as will illustrate the various stages and processes in bleaching, dyeing, and other operations connected with the textile manufactures, as well as those of other local industries, and which will at the same time be of real practical interest to those engaged in the trade of the district.

This museum, it is hoped, may in time become the nucleus of a large technical museum of the local industries, similar to the museums which, at Crefeld and other places on the continent, have rendered such signal service to the trade and manufactures of those districts in which they are situated.

The engineering course requires three years' study and practice, and leads to the degree of bachelor of science in the department of engineering. It is the ordinary technical course.

GLASGOW WEAVING SCHOOL.

Connected with the Technical College at Glasgow there is a weaving branch, whose fourteenth annual report (1889–'90) shows the school to be in a prosperous condition. The weaving department is under the management of a board of trustees. Mr. Thomas Brown is the instructor.

Classes are held day and evening. During the year 1889–'90 fifty students attended the evening classes. The number of day pupils is not given. The work of the classes commences with practical working on the various looms, numbering in all 43, of which 26 are hand and 17 are power looms. On the hand looms a great variety of cloths are woven, from plain goods to the most complicated Jacquard designs. Draughting, cording, and the rearrangement and combination of twills, forming different patterns from the same cording, have been gone into thoroughly at the looms. Many of the students have made collections of the designs and patterns they have worked out at the looms, preserving these collections in their design books. Most of the students also have taken their turn at weaving on each of the looms before changing any original pattern, making full particulars of the make and plans for the reproduction of the cloth.

On the power looms a great variety of cloths have also been made, viz., tweeds, tapestry, leno, skirtings, shirtings, silk handkerchiefs, etc.

At the annual examination in April 1890, 26 students presented themselves; and of this number 17 succeeded in reaching the standard requisite for a diploma. The scope of the examinations in this department may be estimated from a single question (out of the whole num-

ber of 15 questions) submitted to the class on that occasion. Question No. 8 reads:

Give the time that it would take to weave a piece of cloth 60 yards long, with 14 shots on glass, with a drum on line shaft 14 inches in diameter, revolving at 120 revolutions per minute; loom pully 9 inches in diameter, allowing 20 per cent. for stoppages?

At Glasgow evening classes in science and technology have been opened for the benefit of workmen in various trades. Machine construction and drawing, mechanical engineering, and naval architecture, together with mathematics and other related branches, are taught for moderate fees to those engaged in the practical work of engineering, ship building, etc.

UNIVERSITY COLLEGE, NOTTINGHAM.

At University College there are several technical courses, including the chemistry of dyeing and bleaching. This specialty embraces elementary and advanced courses of lectures (together with experimental work) on the dyeing properties of drugs with wool, cotton, silk, etc. The syllabus relates to the properties and uses of acids, alkalies, soaps, etc., the properties of fibres, the mordants of tin, antimony, copper, iron, etc., and their uses and preparation.

The methods of dyeing with various classes of wood and aniline dyes, of obtaining colors fast to light and soap, and, in short, the whole art of dyeing may here be learned by means of lectures and laboratory practice.

Courses have been instituted in mechanical and electrical engineering, in joinery and patternmaking, plumbing, lace and hosiery manufacture, and in printing. Most of these courses require two years' tuition.

BELFAST TECHNICAL SCHOOL.

Since the year 1883 the technical school at Belfast, Ireland, has, as Mr. Duffin, president of the chamber of commerce, well puts it, been carrying on very admirable work with very inadequate resources. Under the provisions of the technical instruction act of 1889, however, greater efficiency will be secured in the near future, since the Belfast corporation strongly favors an increase of appropriations for technical education. The trade specialties taught in this school, with the enrolment in each class during the year 1889–'90, were: Spinning and weaving, 86 pupils; dyeing and bleaching, 19 pupils; drawing and pattern designing, 34 pupils; plumbing—a most important factor in the progress of sanitation—26 pupils; a total of 165.

COVENTRY TECHNICAL INSTITUTE.

Coventry Technical Institute, established in 1887, has for its main object the promotion of the kind of instruction which will improve the

capacity, in a broad sense, of all those upon whom the industries depend.

The horological and textile departments of this institution naturally occupy the foremost place. This is the only school in Great Britain where the entire theoretical and practical instruction in watchmaking is given, though a school in London and another in Edinburgh give instruction for the purpose of educating repairers and jobbers. The watchmaking classes have had an average attendance of from 18 to 25. The workshops are fitted up with the latest and most improved machines. The institute is the nearest approach to a regular trade school of any visited. Coventry is the centre of the watchmaking trade in Great Britain. In the shops of one of the oldest and largest manufacturers of watches in the kingdom the results have been such that the firm now makes it obligatory upon all apprentices to attend the school, allows them time to do so, and pays their expenses. It has also sent a number of its adult workmen to the classes for instruction in special branches. Five other firms have followed its example. Any man applying for employment who has had a technical training is immediately accepted.

All branches of watch and clock making and repairing are systematically taught as well as the theory and practice of the art of weaving. In the textile school the entire course of manufacturing, from the paper design to a completed fabric, is followed under the eyes of the pupils.

LANCASHIRE AND YORKSHIRE RAILWAY COMPANY'S SCHOOL.

The Lancashire and Yorkshire Railway Company maintain a mechanics' technical institute at Horwich in which workmen receive instruction in mechanics, machine construction and drawing, metallurgy, sound, light, heat, etc. During the winter session of 1891-'92 classes in cooking and dressmaking were also organized. These classes were open to the general public, and at fees which are the same to all persons, whether employed by the railway company or not, or whether members or non-members of the institute.

TECHNICAL INSTRUCTION IN COUNTRY DISTRICTS.

Much is left to the discretion of local authorities in England as regards the administration of their trust under the technical instruction act. Accordingly we find that county councils exercise considerable liberty in organizing their various schemes of instruction under the law which lays down the conditions for obtaining government grants.

In the urban districts of Staffordshire, for example, classes have been started for teaching modelling, cookery, chemistry, shorthand, bookkeeping, electricity, mechanics, etc. In the rural districts of the same county have been instituted lectureships on agriculture, mining, etc., together with demonstrations in butter making, cooking, etc., in classes conducted at many convenient centres.

In Cambridgeshire for the purposes of technical education the county was divided into nine districts. It was determined to provide three of them with university extension lectures on scientific subjects bearing upon agriculture. Three others were to be visited by women lecturers from the National Health Society to give information upon the subjects of health and cookery. Two of the remaining three were to receive courses of dairy instruction from the Eastern Counties Dairy Institute; and one was to have the services of a competent teacher of fruit culture.

The committee determined that each group of three districts shall receive in turn the university extension lectures with the accompanying class work, paper work, and examinations, so that, in three years, the whole county will have participated in the advantages to be derived therefrom.

Lecturers on these subjects were supplied by the University of Cambridge. The courses for the year 1891-'92 are on the following subjects: Injurious Insects, Mr. Cecil Warburton, M. A.; Agricultural Botany, Mr. W. G. P. Ellis, M. A.; Agricultural Chemistry, Mr. A. P. Laurie, M. A. and Mr. R. M. Lewis, M. A.; Healthy Bodies and Healthy Homes, Miss A. Kenealy.

Arrangements are in progress for the opening of courses in dairying, in cookery, and in fruit culture. A misapprehension to the effect that the lecutres are paid for out of money derived from taxation is corrected by the reporter for this county. He says:

The technical education fund is handed over by the treasury to county councils, and is obtained by the government of the country from the spirit duties. The county council can not levy nor remit these duties. What it can do is to spend its share of the grant received from them in the provision of technical instruction for the people of the county. No one pays a penny more in rates because this instruction is sent into his neighborhood. If a village declines to receive the teachers its inhabitants will pay just the same taxes as they paid before, and will go without a return in the shape of valuable education.

Substantially the same method of utilizing the grant from the government obtains in the other counties. In Kent the fund is used to pay for university extension lectures, for scholarships at the Horticultural College, Swanley, for instructing elementary school teachers in agriculture, for teaching cookery, for providing dairy instruction by means of a migratory dairy school, for the conduct of wood carving and bee keeping classes, etc.

The county schemes of instruction present a marked diversity of features. Each is planned to meet the requirements of local conditions as to trade or production. The new machinery of technical education in Great Britain is not yet in perfect running order, but it is made of the best materials, and only needs skilful management to insure satisfactory results.

In east Suffolk county classes are organized for the study of agri-

cultural chemistry, ambulance work, bookkeeping, cookery, dairying, drawing, farriery, fish curing, horticulture, laundry work, electricity, mathematics, mechanics, mensuration, modern languages, navigation, shorthand, wood carving, etc.

In Berkshire county it is proposed to extend the benefits of the technical instruction act to girls as well as boys in the rural districts. The committee recommend, therefore, the establishment of a laundry school, in which girls may be practically trained to become efficient laundresses. The committee ask for a grant of £400 ($1,946.60) for such a school.

In the same county, during the year 1892, there were held 27 courses of instruction in cookery, with 2,403 pupils, and 27 courses in cottage sick nursery and domestic economy, with 4,491 pupils.

RESULTS OF TECHNICAL EDUCATION.

The existence of technical education to any extent in Great Britain is of so recent a date that in the cases of the great majority of schools a definite knowledge of results from the work of ex-students was almost unobtainable. Though nearly every technical school in the country was visited, less than five had had an active existence of five years. In no case did a school keep a record of its students, showing where they were employed.

With one or two exceptions the schools are not trade schools properly so called. They are, however, more of the nature of trade schools than of manual training schools, inasmuch as their courses prepare specially for particular trades. In the majority of cases the schools maintain both day and evening courses. The attendance on the latter is vastly greater than that on the former, and consists almost entirely of young men then engaged in the shops in trades to which their courses of instruction relate. The day scholars are few in number, and consist largely of the sons of employés who desire a knowledge of the business preparatory to going into the office or becoming salesmen.

OPINIONS OF ENGLISH EMPLOYERS.

In England the utility of trade school training is generally conceded to be considerable, though many employers hold the opinion that the superiority of a technically educated apprentice in any mechanical occupation is manifest, not in greater manual dexterity, but in the ability to comprehend general principles and in the power of reducing theoretical knowledge to tangible results.

For example, Mr. L. A. Edwards, mechanical engineer, London agent of the Electrical Construction Company (limited), of London, himself an engineer of 23 years' experience and educated at King's College, says:

Technical schools, although fulfilling a useful purpose, do not come

up to the practical requirements of the apprentice who has decided to adopt the engineering profession. * * *

Technical schools are mostly useful in imparting a theoretical knowledge, a subject often entirely neglected in the training of an engineer.

In another connection Mr. Edwards observes that the education of an engineer should be as general as possible to start with, and the specializing should be postponed to a later period.

Of like tenor is the letter received from a member of the firm of Burt, Boulton, and Haywood, manufacturing chemists, of 64 Cannon street, London. While not disparaging thorough scientific chemical training, but insisting upon its possession as a condition precedent to employment in the business of the firm, the writer states that then it is possible to teach men, so prepared for instruction, the technical part of their business in the laboratories and manufactories. He adds:

A school professor can only teach that which he knows, and the technical training in a particular manufacture, whose processes are constantly changing and developing, can only be adequately taught in the manufacture itself.

As to the direct effect of technical instruction upon the artisan Mr. H. W. Morley, secretary of the firm of Cole, Marchant, and Morley, machinists, Bradford, writes as follows concerning an employé who had completed the full course of study at the Bradford Technical College:

He was able to work out designs and drawings of machines which he had never seen by mathematical calculations and the principles learned at college.

Mr. George N. Hooper, senior member of the firm of Hooper and Co., carriage manufacturers, London, writes:

As a proof of the value attached to training in technical classes it may be mentioned that attendance at these classes is an essential condition to the employment of all lads engaged by this firm. The school fees are invariably paid by the firm, the prize fund is subsidized by it, and special encouragement is given to lads for regular attendance, application, and good progress.

In reference to the general subject of technical education in England Mr. J. C. Peachy, manager of the Ferry works, Thames Ditton, Surrey, speaking as a mechanical engineer, says:

We have in England no such institution as we understand you to refer to by "trade school." Our nearest approach to this is the mechanics' institution, where instruction on technical subjects is given to apprentices and others after their usual hours of work, and technical colleges which young men attend for a course of two or three years, either before or after apprenticeship to some branch of engineering, and preparatory to searching for employment in some capacity other than that of a workman.

The watchmakers of Coventry are unanimous and emphatic in their expression of approval of trade school training and in their apprecia-

tion of its beneficial effect upon apprentices and of its value to employers.

The shoe manufacturers of Bristol differ widely in opinion as to the usefulness of trade school instruction for their apprentices. Messrs. Church and McPherson think the schools valuable and Mr. H. A. Carter declares that "what is taught at the schools is far better than our secrets," that is, the trade secrets which many manufacturers jealously guard. J. W. Ashley and Co. dissent from this view and declare that, according to their experience, apprentices, "instead of being improved, were rather spoiled by the little information which they did obtain." In their opinion, "the trade can not be learned better at schools than in the work room, but can probably be learned much more quickly; but the employers get but little benefit."

Master plumbers at Bristol, and at Aberdeen and Glasgow, prefer boys educated at trade schools as apprentices and deem them more valuable.

Mr. John Sharp probably expresses the prevailing opinion when, in referring to his trade school instruction, he says that he was benefited by it "not in the line of becoming a more skilful user of tools, but in the theory and science information which I could not have obtained in the shops."

Brock and Son, master builders of Bristol, consider the knowledge of tools acquired in the trade school to be of but little account, while they hold that the mastery of general mechanical principles is of great advantage to the apprentice.

Managers of locomotive works say that technical instruction greatly aids the apprentice in his business, inasmuch as it enables him to read drawings and work from a plan. Of 22 employés of the Great Eastern Railway works, 10 received technical instruction at the Great Eastern Railway Mechanics' Institute, 2 at King's College, 3 at Finsbury Technical College, 1 at Sheffield Technical School, 1 at the Regent street Polytechnic, 2 at the Crystal Palace School, and 1 each at University College, Birkbeck Institute, and at the City and Guilds of London Central Institute.

Concerning the value of technical training to electrical engineers, Mr. Charles Meredith, who obtained his education at the Merchant Venturers' School and Bristol College, writes as follows:

> I know that my training, acquired at the Merchant Venturers' School and in the laboratory of Bristol College, has been of the greatest benefit to me in my trade and has enabled me to win advancement to my present position of chief foreman of the shops.

A veneering of technical knowledge will not suffice to hide the defects of elementary education, says an intelligent surveyor; or, in his own words, "No amount of technical education can fit a man for this business, if he lacks education in the rudiments."

CONCLUSION.

The general comment that seems warranted, where personal examination of the institutions themselves, or their lines and methods of study has been made, is that there appears to be a lack of that exactness and critical fidelity to a high standard in the requirements from pupils which is so marked a feature of the technical training of the United States, certainly in its best schools.

This is perhaps due to the fact that so large a percentage of the pupils in the industrial and technical schools of Great Britain are of the night classes and of the working, rather than of the student class.

It is, of course, manifestly impossible that a tired young workman, adding two hours of hard work to his day's labor in the work of an evening class, can be held to the precision and exactness of detail which should be required of the day student following the lines of study only. It is significant as proof of how hopeless this is considered that there are no check markings of each evening's work, but that final or stated examinations are all that are attempted.

Even in the higher technical colleges the exactions of nicety and precision do not equal those of the leading technical colleges in the United States. On the other hand it may well be doubted whether the recreative and social features which are the seemingly inseparable concomitants in the British mind of all study, industrial especially, do not include an advantage, not obtained in American schools, that fairly offsets the lack mentioned.

Class distinctions and the special requirements for the British people that arise from them must also be considered as having an important bearing on any measures or methods adopted there. These and the power of the trade unions are factors that require consideration in all these and similar institutions on that side of the Atlantic.

SCHOOLS OF AGRICULTURE.

The number of institutions engaged exclusively in this work or having departments so engaged is not large, and they only are enumerated. There is no college of agriculture maintained and conducted wholly by the government, but grants are made to existing schools and agricultural and dairy societies by the committee of council for agriculture.

The testimony of the educational and agricultural press is seemingly concurrent as to the present absence and the recognized need of more and better schools for the promotion of hand skill and technical knowledge in this department.

Present reliance for the diffusion of practical and scientific information upon agricultural subjects throughout the kingdom seems to be rather upon lectures and didactic instruction than by systematic and illustrative teaching, the dairy and agricultural societies usually being *the prime movers.*

ROYAL AGRICULTURAL COLLEGE.

The Royal Agricultural College, Cirencester, was incorporated by royal charter in 1845. In 1870 a supplemental charter, with new powers, was obtained, and in March 1880 the college, by command of the queen, was styled the Royal Agricultural College. In-students pay £135 ($656.98) and out-students £75 ($364.99) per annum. There are also a few extras. The objects of the institution, in the words of its charter, are "to teach the science of agriculture, and the various sciences connected therewith; the practical application in the cultivation of the soil; and the rearing and management of stock." There are a chapel, library, museum, botanic garden, lecture theatre, laboratories, veterinary hospital, meteorological station, and workshops. The farm, which is of a mixed character, consists of about 500 acres, of which 450 are arable, so variable as to admit of experimental treatment. There are six residentiary professorial chairs, and the college grants certificates of proficiency and a diploma of membership or association. The course of instruction embraces practical agriculture and rural economy; estate management; bookkeeping; chemistry; natural history; physics and mechanics; mensuration; land surveying and estate engineering; veterinary science and practice; architectural and mechanical farm drawing; lathe, carpentry and wheelwright work, smith work, and saddlery; and garden work.

There are several scholarships open to the students, viz., one entrance scholarship of £20 ($97.33) per annum for two and one-half years; three of £25 ($121.66) each and 6 of £10 ($48.67) each annually; and 6 of £200 ($973.30) a year each (2 annually) by the government of Bengal—tenable two and one-half years. Class and practical work prizes, certificates of honor, and gold medals are also awarded.

DOWNTON COLLEGE OF AGRICULTURE.

The Downton College of Agriculture (near Salisbury) was established in 1880, with the object of supplying sound and practical instruction in agricultural subjects, to qualify students to be land agents, farmers, or surveyors. The method of instruction consists of field classes, practical work, and catechetical lectures. Weekly examinations are conducted on the farm, in the laboratories, and by printed papers. Each student keeps a farm journal, which is inspected and reported upon at regular intervals. The subjects of instruction include agriculture and dairy and pastoral farming, estate management, land agency, forestry, mensuration, land surveying, architectural drawing, bookkeeping, chemistry, geology, botany, veterinary surgery, etc. A complete two years' course prepares for the examinations of the Royal Agricultural Society and of the Institution of Surveyors. There is a farm of about 600 acres, and students are expected to take part in field operations and to assist with live stock when required. Gentlemen over 21 years of

age are received as out-students. The fee for in-students, including board, lodging, tuition, and laundry, is £126 ($613.18); out-students, £60 ($291.99) per annum. There are some extras for private rooms, etc. A scholarship of £10 ($48.67) is offered for competition among the students who have completed their first year, and prizes are awarded for proficiency.

TAMWORTH AGRICULTURAL COLLEGE AND TRAINING FARM.

Tamworth Agricultural College and Training Farm was established in 1886. The management is in private hands. There is accommodation for 40 students from 15 to 20 years of age. The instruction includes scientific and practical home and colonial farming. The fees for board and tuition vary from £18 to £26 ($87.60 to $126.53) a term, there being three terms a year. The training farm, 1,000 acres, is managed by the college masters and students. There is a corn mill attached to the college.

There are several other schools of a similar character. Among these the Aspatria Agricultural College, near Carlisle, the Cheshire county dairy school, the department of agriculture of Edinburgh University, and the department of agriculture of the Glasgow and West of Scotland Technical College are awarded grants by the committee of council for agriculture.

DAIRY SCHOOLS.

The Suffolk Dairy Institute, Forfarshire and Kincardine Dairy School, and Kilmarnock Dairy School are all engaged in giving special instruction in their relative lines, and are applicants for grants from the committee of council for agriculture.

The direct influence of the instruction given in the English agricultural schools is shown by the results at the Munster Dairy School. These are described by Mr. Jenkins, one of the royal commissioners of Great Britain, who says:

The great agricultural trade of the south of Ireland is butter making. In former times the butter of the Cork market was esteemed very highly throughout the United Kingdom. In recent times the Cork brand declined considerably in public favor.

An effort was, therefore, made to revive the reputation of the Cork butter. This movement took shape in making the farm at Munster a training establishment for the education of dairymaids. Mr. Jenkins adds:

The butter which was made at the school almost immediately obtained a high reputation and commanded the best price. At the Birmingham dairy show in 1881 the success of the school produced quite a sensation in the agricultural world. The prizes which it obtained at the show were first, second, and third in the fresh butter class. Subsequently, at Islington, other important prizes were awarded to the school, viz., first and second prizes in the fresh butter classes, special prize for salt but-

ter, special prizes given by the judges for excellency of entries, and also the champion cup presented by the lord mayor of London and the city corporation for the best butter exhibited.

The young women who are educated as dairymaids in the school are chiefly the daughters of Munster farmers. The stipend paid by each for the six weeks' course is only £3 ($14.60). * * * The success, so rapid and complete, of this school is said already to have increased the value of the dairy produce of Munster by so large a sum that I hesitate to record it. But there can be no doubt whatever that this propitious experiment has proved not only to be a turning point in the fortunes of Irish agriculture, but a practical lesson to the whole population of Munster that education is not a device of statesmen to make people only masters of books and of sciences, but that, wisely directed, it is all the while a certain means of promoting their material prosperity.

It must not be inferred that instruction in the Munster school is limited to the mere details of the manipulation of butter. On the contrary the training in dairy management includes instruction in the nature of the food and feeding of milch cows, in the nature of milk and its products, as well as in practical demonstrations of the most approved methods of handling milk and making butter with modern and with ordinary appliances.

The success of the school has won for it state aid to the amount of £526 ($2,559.78) per annum. Without this support there can be no question that it would soon share the fate of all schools of practical agriculture that are not subsidized; that is to say, it would cease to exist.

This typical dairy school has been described at some length in the belief that (both for the purposes of example and of warning) it is necessary to understand somewhat in detail the practical management of an educational system, whether that system be agricultural, scientific, or literary. We can not undertake to catalogue all the farm schools of various grades that exist in Great Britain; and, were it possible, the execution of such a task would be of doubtful service. One must gain a clear perception of both excellences and defects in an institution that is set forth as a model, in order to know what to avoid and what to imitate. The servile copying of the methods of the Munster school in America would be an egregious blunder, but it may be possible to derive some useful hints from its course of instruction.

CHAPTER VII.

PRESENT STATUS OF INDUSTRIAL EDUCATION IN ITALY.

CHAPTER VII.

PRESENT STATUS OF INDUSTRIAL EDUCATION IN ITALY.

Italy is beginning to feel the influence of the international movement in favor of manual training and technical education. Though handicapped by peculiar difficulties in entering upon the work of reconstructing her school system, she has bravely made an effort in this direction; and will doubtless succeed at last in so readjusting the relations of her educational establishments as to bring them into closer harmony with the conditions of modern commercial life and business enterprise.

A bill was introduced in the chamber of deputies (of the Italian parliament) during the session of 1889–'90, under the joint authority of the minister of agriculture, industry, and commerce, and the minister of public instruction, which provided for the reorganization of the school system of Italy, and the gradual evolution of art and trade schools, and of special schools for the promotion of industry and commerce.

On presenting this bill the two above named officers addressed to the chamber of deputies a clear and logical memorial in support of the measure. They urged that the bill "does not create a new type of school, but determines the legal status of existing types." They advocated a reform in school management, however, as entirely feasible without doing violence to established methods.

"The technical school," said they, "has two functions—one is to give the general culture necessary for admission to the technical institute, the other is to give the special training that is an end in itself. * * * The character of this special training should depend upon the particular enterprises carried on in the respective localities, whether art, industry, or commerce predominates."

The idea which they explained and amplified at some length was that the technical schools must inevitably become industrial schools of arts and trades, or of art applied to the industries. This evolution is in progress in France, transforming into professional schools their continuation schools, which correspond to the Italian technical schools.

"The names applied to the schools should correspond to their intrinsic nature in every instance" is the aphoristic expression by which the scheme for changing the designation of the different classes of schools is justified.

The innovation is a comprehensive one. Title I, article 1, of the bill declares that all scholastic institutions (day, evening, Sunday, and

vacation schools) "whose design is to promote and perfect national industry" shall be governed by the present law. They are to be distinguished as schools of arts and trades, and schools of art applied to industries.

Title IV, article 23, states that the provisions of the present law are applicable—

1. To the higher schools of commerce, at Venice, at Genoa, and at Bari. These impart higher scientific education, with the applications of science to various branches of domestic and international commerce.
2. To the Industrial Museum at Turin.
3. To the Superior Naval School of Genoa.

Article 24 requires that the instruction given in these schools "shall be coördinated with that of the technical institutes, that of the commercial sections with the courses in the higher schools of commerce, and that of the physico-mathematical and industrial sections with the curricula of the Industrial Museum and of the Naval School."

In concluding their comments on the new project of law the two ministers observe that it is "especially recommended to your favorable suffrage by virtue of the end which it contemplates—the increase, and the technical and æsthetic improvement, of industrial production, * * * the promotion of national industry, and the economic progress of the laboring classes."

At Genoa manual training is about to be introduced into the communal schools. At present it is experimentally taught to some 400 pupils.

The School of Industrial Design and Elementary Mechanics at Naples comes very near the manual training system. There is a small shop connected with the school, where the rudiments of practical metal working are taught. No workmen are graduated here; boys are only prepared to adopt later on some trade in the line of metal working. In this school are 8 teachers and 40 pupils. An income of 8,000 lire ($1,544) supports this school. Of this sum the state grants 3,200 lire ($617.60); the province, 2,000 lire ($386); the municipality, 1,600 lire ($308.80); and the chamber of commerce, 1,200 lire ($231.60). This school was organized about six years ago, but it is not in a flourishing condition.

In Italy, at the close of the school year 1886–'87, there were 419 technical schools, and 74 institutes of secondary technical instruction. In the technical schools there were 28,140 pupils in regular standing as to membership, and 628 auditors, or pupils attending certain classes, but not enrolled as full time students. The technical institutes, which are of a higher grade than the technical schools, had at that date 6,231 students and 410 auditors.

In proportion to the population there is in Italy one technical school to every 67,923 of the inhabitants and one technical institute to every 384,589 of the inhabitants, or 57,727 inhabitants for each technical institution of higher and lower grade. There are 12.08 technical students in these schools to every 10,000 of the population. The number of tech-

nical schools in Italy increased by more than one hundred from 1880 to 1887. In the year 1880 there were 314, while in 1887 there were, as above stated, 419. Within the same period the number of pupils increased from 22,120 to 28,140.

The foregoing figures do not include the institutes of technical instruction of the mercantile marine. Of these there were 23, with 595 students and 36 auditors at the end of the school year 1886–'87. It would be inconsistent with the object of this inquiry to make extended reference to the Italian lyceum, gymnasium, or university, but there are several special higher schools and institutes which deserve to be mentioned.

Among the higher institutes those devoted to technical studies are the following:

At Bologna is an institute of civil engineering and architecture, having in each department a three years' course of study, and attended in 1886–'87 by 131 students. At Milan there is a technical institute with a course of instruction divided into three sections, viz., a preparatory course of two years' duration, with 123 pupils enrolled in the school year 1886–'87; an engineering and architectural course of three years, with 166 pupils; and a course of physics and chemistry of four years, with 3 pupils. Naples, also, has an institute of civil engineering and architecture, with 214 students of engineering and 2 of architecture in 1886–'87; the course of study covers three years in each department. Rome has a similar institute, with a course of study of the same length, but with only one student pursuing architecture and 81 in the department of civil engineering. The Turin institute has three departments. In 1886–'87 there were 305 students of civil engineering, 89 taking industrial engineering, and none studying architecture.

Among the special schools, of a rank below the institute, may be named the commercial school in the small town of Bari, which was attended by 49 pupils in 1886–'87; the commercial school at Genoa, with its 27 pupils; the school of naval engineering, mechanics, nautical training, and hydrographic engineering at the same place, having 89 students; the schools of agriculture at Milan and Portici, the former having 44 students, the latter, 72; the Industrial Museum at Turin, with its electrical engineering course and 75 students; and the commercial school at Venice, with its two, three, and four years' courses and its 88 students in the year 1886–'87.

The British commissioners visited the Milan institute and in their report referred to it in the following terms:

The Technical Institute of Milan is situated in the via San Marco. Like most of the schools and many of the private houses of Milan it was originally a convent. We had the opportunity of being present when lessons were being given in the ordinary subjects of instruction, and likewise of inspecting the appliances and methods of teaching for the special subjects. In one room we found a class of boys receiving a

lesson in trigonometry; in another the subject was history. The walls of the rooms were perfectly bare, and no attempt seemed to be made to illustrate the subject of instruction. The master was lecturing and the boys were listening.

As in the other Italian schools visited the appliances here for teaching drawing were good, and the instruction in this subject was both general and technical.

Several rooms of the school or college are occupied by physical apparatus for the instruction of those who enter the physico-mathematical section. * * *

The museum of the department of agriculture contained models and illustrations of much with which a practical agriculturist has to be familiar, besides actual specimens of a great variety of natural products. Here were collected and well classified different kinds of ploughs and other agricultural implements and machinery; specimens of tools, historically arranged; collections of herbs, cereals, roots, etc.; specimens of woods, showing the vertical, horizontal, and oblique sections, and the polish of which each kind is susceptible; preparations exhibiting the chemical constituents of vegetable substances; models of different kinds of apples, pears, fruits, etc., indicating where they are severally grown; specimens of the soil taken from different parts of the valley of the Po; the various kinds of grapes; models and diagrams of the phylloxera, and of its effect on the plant, etc.

Of the chemical department the commissioners say:

The general laboratory affords accommodation for about 60 pupils to work at the same time. The instruction embraces the metals and metalloids and qualitative analysis. The apparatus is on an extensive scale. * * * One room was occupied by physico-chemical apparatus, including batteries, spectroscopes, etc. The professors of the three divisions into which the teaching of the school is divided are each persons of scientific authority in his own branch of study.

All of the technical institutes of Italy are similar in character to that of Milan, and the courses of instruction in each of them are prescribed by the educational department of the government. Pupils are admitted to the technical institutes at the age of 14, on presentation of their diplomas from some technical school.

Some of these technical institutes are said to have given a strong impulse to local industries. Thus the British commissioners report that the directors of the silk dyeing establishment at Como spoke in high praise of the influence of the technical school of Como. It had materially and beneficially affected the silk industry by greatly increasing the knowledge both of masters and foremen. A higher culture in designing had led to more variety, more enterprise, and increased trade. A few years ago scarcely anything but the weaving of plain silks was attempted; now there is a growing fancy trade, the influence of which is felt in a marked degree at these works, by the greater demand for varied and delicate colors in the dyeing.

There is a government technical school in the province of Foggia, where, during the school year 1888-'89, 150 pupils were in attendance. In the same province, and at the same period, there were three other

technical schools with an aggregate of 189 pupils. A school of the mechanic arts was opened in 1874 in this province. One hundred and twenty-seven students attended this school during the year 1889–'90.

La Scuola Professionale Tipografica di Milano was founded November 4, 1884, by the municipal typographical societies of Milan. It was hampered, however, by the want of financial backing at the start. At the opening of the first course, in 1885, there were 87 pupils in attendance. In 1888, by a ministerial decree, the school was chartered, and the expenses of its maintenance were fixed, by article 2, at the sum of 5,000 lire ($965) per annum. Provision was made, also, for meeting this expense by means of subventions from the state, province, commune, the chamber of commerce, etc. A school so recently organized can have but a brief biography, and little is stated beyond the above facts in any report.

The enterprise of the school management is shown by the publication of several pamphlets, under the auspices of the council, on subjects relating to the art of printing and collateral or cognate branches of bookmaking. We have carefully examined these brochures, and have received very favorable impressions as to the thoroughness of their teaching. One of them is on practical rules of typography, and treats of the making up of printing forms, the working of presses, etc. Another is a lucid dissertation on the correction of proof, in which the anomalous and variable orthography of the Italian language is severely scored. Still another gives a succinct history of the invention of typesetting machines, with cuts showing the mechanism of the Fraser typesetter, that of Lagermann, and that of Joseph Thorne. All the pamphlets bear the imprint of the Milan Typographical School, and are useful and instructive writings, though perhaps not germane to the matter.

In November 1889 the studies of languages and drawing were made a part of the course of instruction. French and Italian are the languages studied. In the technical departments four instructors are employed to teach compositors and four to teach press work, etc. The course is of three years' duration. In 1890 there were in this school 190 enrolled pupils. Of this number there were in the drawing classes 57; in Italian, 47; in French, 86.

Most of the Italian schools are under ecclesiastical control, and it is impossible to classify them exactly. Some of them are a combination of school and hospital. This is true of the *Pia Casa di Lavoro* at Florence, an elementary school for the intellectual and industrial education of both sexes. The boys are taught reading, writing, arithmetic, the elements of practical geometry, linear drawing, ornamental drawing, and gymnastics. The girls also take the elementary branches and are taught women's work suited to their condition. At the beginning of the year 1890 there were 842 inmates of this institution—538 males, 304 females. December 31, 1890, there were 634 males and 345 *females—979 in all.*

At La Spezia there is a royal school of arts and trades (*Reale Scuola d'Arti e Mestieri*) which was established by a decree of King Humbert, dated February 21, 1886. The object of the school is the giving of instruction applicable to the mechanic arts and trades. The cost of annual maintenance is by means of state and other subsidies. Pupils must be 11 years old or over.

The courses of study and practice are as follows: The elements of geometry, of physics, of chemistry, of the technology of wood and iron and other materials for building, of drawing, of modelling and intaglio work, with special application to the industries in which the school is concerned. Besides these branches Italian is to be taught, with arithmetic and the elements of algebra, accounts, penmanship, and industrial economy. The course of training occupies four years. According to the regulations for the conduct of the school the instruction is given in two sections and is comprised in two courses.

The first year's course is common to both sections, and includes the principal operations in whole numbers, linear and ornamental drawing and penmanship, geometry and its applications, the Italian language, its orthography and parts of speech, grammatical analysis, simple accounts, the principal facts of the ancient history of Italy, the industrial and commercial geography of the region, and the elements of chemistry and physics.

In the second year the class is divided into the mechanical section and the section of construction. Both sections are taught in common in the following branches, viz., fractions (numerical and literal) and problems of the first degree with one and two unknown quantities, geometry and its applications, commercial and descriptive letter writing, history of the epoch of the middle ages with chief events, and industrial and commercial geography of northern Italy. Special instruction in the mechanical section includes projections, penmanship, practical mechanics, and industrial physics; in the section of construction, architectural and naval drawing, penmanship, and chemistry in its applications.

In the third year the common subjects in both sections are Italian, composition in general, description and narration, equations of the second degree, progression, logarithms and their properties with the use of tables, diagrams, and analytical geometry, modern Italian history, industrial geography, and commerce of central and southern Italy. Special instruction in the mechanical section includes machine drawing (sections), practical mechanics, physics, and industrial chemistry; in the section of construction, naval drawing, technology and mechanics, and materials of construction.

In the fourth year special instruction for the first section is in materials, metals, etc., machine drawing to scale, machine building, and general management of motors; for the second section, drawing for civil engineering and naval construction, plans of construction in general.

By a royal decree dated January 5, 1873, a school of arts and trades

was instituted at Foligno, in order to furnish instruction to such as wish to fit themselves for workmen in wood and metals and in the building trades. The school is divided into two sections—one a preparatory school and the other a school of arts and trades.

The prescribed course in the former lasts two years; in the art and trade section, three years. The instruction includes the Italian language, history, geography, penmanship, French, arithmetic, accounts, geometry (plane and solid), algebra, trigonometry, ornamental, architectural, mechanical, industrial, and topographical drawing, mechanical technology, building construction, descriptive geometry, kinematics, theoretical and practical mechanics, estimates of work, physics, industrial chemistry, and political economy.

Provision is made for the employment of a teaching staff consisting of four professors, each at a salary of 1,800 lire ($347.40) per annum, viz., a professor of arithmetic, plane and solid geometry, algebra, physics, chemistry, and mineralogy; a professor of the Italian language and literature, history, geography, chirography, French, and accounts; a professor of ornamental drawing, architecture and the plastic arts, designing of ornaments, and of drawing applied to industrial and architectural uses; a professor of mechanical technology, theoretical and practical mechanics, machine drawing, kinematics, trigonometry, topographical surveying, measurement of altitudes, building construction, estimation of cost, etc.

To gain admission to this school pupils must be at least 13 years old, in good health, and have a physician's certificate of vaccination; they must also have completed the elementary course of studies in a public or private school, and present a certificate of good behavior from the local authority.

In a letter dated March 27, 1892, Prof. T. Buccolini, director of this institute, writes that the school is free, the pupils paying merely an annual enrolment fee of 30 lire ($5.79).

The whole number of pupils enrolled in the year 1890–'91 was 66. Of these there were in the first year's course, 33; second year's, 16; third year's, 7; fourth year's, 7; fifth year's, 3; a total of 66. This number of pupils seems small, but there have never before been so many in attendance during the sixteen years' existence of the school. Most of the pupils are said to prefer the trade of iron workers. The estimate of the expenses of the school for the year 1891–'92 is put at about 15,000 lire ($2,895).

The professional school of Savona, founded by a royal decree bearing date of August 15, 1871, was instituted for the purpose of giving industrial instruction. It consists of two distinct sections—the mechanical section and the chemical section. The programme outlines a four years' course of study. The first year's work is general and preparatory; afterwards special subjects are taught. Elementary instruction is given in geometry, algebra, physics, chemistry, mechanics, tech-

nology, and drawing with special regard to industries. The Italian language, arithmetic, penmanship, and history are also included among the branches taught.

For admission to the preparatory class in this school the pupil must be at least 9 years of age and not over 17. To enter the evening class he must be 14 years old, and able to read and write. Each pupil pays a matriculation fee of 2.20 lire (42 cents).

The total income of the Savona school for the year 1883 was 20,370 lire ($3,931.41). The expenditures for the year were 20,836 lire ($4,021.35), leaving a deficit of 466 lire ($89.94).

In the graduating class of 1883 there were six members (day school). Of these one has become a decorator in ceramic art; one, a decorator in stucco; one, an assistant in the drawing school; one, a student in the Nautical Institute; one, a tradesman; and one, a churchman. The evening class, graduating the same year, consisted of six members. All but one of these has adopted some mechanical occupation. The one exception is devoted to a military career.

There are in Savona two gymnasia, one lyceum, one technical school, one technical institute, and a nautical institute, besides this professional school.

The School of Art Applied to Industry (*Scuola d' Arte Applicata all' Industria*) at Luzzara was instituted by a ministerial decree issued in 1881, in support of the School of Drawing opened at the close of the year 1868.

The minister of agriculture, industry, and commerce grants to this school an annual allowance of 1,200 lire ($231,60); the commune, 1,000 lire ($193); and the province, 400 lire ($77.20). The chamber of commerce of Reggio nell' Emilia also contributes 150 lire ($28.95) annually.

Statistics of the school for ten years are as follows:

School year.	Attendance.	Enrolment.	Graduates.
1881-'82	33	53	2
1882-'83	42	48	4
1883-'84	46	50	5
1884-'85	49	52	4
1885-'86	57	61	6
1886-'87	56	65	7
1887-'88	64	68	14
1888-'89	75	78	13
1889-'90	75	82	16
1890-'91	83	93	17

The subjects of study in the school are: Ornamental drawing, geometrical drawing, architectural drawing, elements of figure drawing, modelling, intaglio work, civil engineering, and elements of machine drawing. The principal instruction imparted in this school consists of the drawing—free-hand, ornamental, and figure drawing, and geometrical, architectural, mechanical, and topographical drawing. With this instruction its applications in modelling, carving, etc., are taught in the different courses.

La Reale Scuola Professionale di Fabriano is maintained jointly by the government, the province, the commune, and the chamber of commerce. There are two sections of the school. The first section includes the pupils enrolled in the shops, the other section the pupils enrolled in the scholastic courses. Pupils are not admitted to the first section if under 11 or over 17 years of age; in the second section none can be received under 11 years of age. When the pupils of the first section have finished the course they may enter a shop to perfect themselves in manual labor; those of the second section, not having received the combined training of culture and technical instruction so useful in the artistic professions, may easily become proficient in the trades of the school course.

The Aldini-Valeriani Institute at Bologna is a technical school. Its compound title was given it in honor of its founders, one of whom, Prof. Giovanni Aldini, in 1834, by his last will and testament, made provision for the establishment of a school of mechanic arts, and of chemistry as applied to the arts of manufacture, to be under the joint control of a committee composed of members of the university staff, of competent artists, and of the government council. To this school, constituted on such a plan, Prof. Valeriani added an equipment for instruction in drawing applied to the arts.

The general scope of the Bologna institute is to promote technical knowledge, to train the eye and hand in the acquisition of mechanic art, and physical and chemical manipulation; to give popular courses of instruction in technical science and drawing to adult artisans; and, in general, to contribute to the improvement of art by means of instruction and experimentation in science.

The institute appears to have a good equipment for its proposed work, possessing a rich collection of machines, apparatus, models, drawings, books, etc. It has a school shop with motors and machine tools for working in wood, iron, etc., a laboratory (chemical and physical), a large drawing room, and two halls for recitations, reading, etc. The location is the convent of Santa Lucia in via Castiglione; and the establishment is supplied with water, gas, and (in part) with electric lights.

The current expenses of the institute for the year 1891 were 39,370 lire ($7,598.41). The amount was covered by the income of the school, derived from funds from the commune, from the grant of the minister of agriculture, industry, and commerce, from the evening school fees, and from various contributions.

There are three sections or subdivisions of the institute, with a respective attendance in 1890–'91 as follows:

Day section, mechanic arts department, 128; chemical and physical department, none. Evening section of geometrical and ornamental drawing, etc., all classes (number enrolled), 255; subsection, steam engineering, 102. Of these 75 were born in the commune of Bologna, 24 in other communes of the province of Bologna, 27 in other provinces,

and 2 were foreign born. Pupils are admitted to membership in the institute at 12 years of age, if qualified for the successful pursuit of its courses of study.

The course of instruction in the department of the mechanic arts comprises the following subjects: The Italian language, geometry, the elements of physics, of chemistry, of mechanics, and of technology; morals and economics, ornamental drawing, drawing applied to the arts, general studies and exercises, and last, but not least, practice in the school shop. In the physico-chemical department the studies are essentially the same, except that practice in the chemical laboratory is substituted in a large measure for shop work. Fifty-four hours a week are occupied with school work throughout the three years' course. One-half of this time is spent in the shop.

There are six instructors in the institute—one for each of the chief specialties taught. But, besides these, there are eight assistants and master workmen who give shop instruction.

The *Museo Artistico Industriale e Scuole Officine* in Naples is one of the few schools which are under the control of the government. It was established in 1883; has an income of about 95,000 lire ($18,335), of which sum, however, the state contributes only 30,000 lire ($5,790), the rest being given by the province, the municipality, and by donation. The school is of an artistic character only, with 18 teachers and about 200 scholars. The course of instruction lasts three years, but continues through nearly eleven months of each year. The shops consist of—ceramics, with painting, ornamenting, etc.; metal casting, on a very small scale and for ornamental purposes only, in zinc, lead, brass, and silver; gold and silver smithing, and enamelling; engraving; lithography, and chromolithography; wood carving, intarsia, and fine wood working for furniture; chiselling. The engraving, lithographing, and wood working departments had apparently about three-fourths of all the scholars. The theoretical instruction given refers only to the arts mentioned, no general educational instruction being given as the pupils are admitted only after an examination.

Scuola Industriale Alessandro Volta, Naples, is a small school established in 1886, mainly under the control of the municipality, although the state grants a yearly subsidy of 25,000 lire ($4,825). The entire income is only about 56,000 lire ($10,808). It is a good practical school, but not patronized as it should be. There is too much hard work connected with the trades taught there. There are 11 teachers and only about 65 pupils. The scope of this school is to educate good practical machinists, but it seems that the course is entirely too short, there being only three years allotted to the practical course. General education is also given, and its extent is about *al pari* with our high schools. The school has a good machine shop with steam power and modern tools; only metals are worked. Pupils must pass a mild examination.

Istituto Casanova, Naples, is the largest and probably the best appointed school in the entire south of Italy. It, like the preceding ones, was established by large hearted philanthropists who saw clearly the necessity of providing for the education of the children of the poor.

This school was established in 1880. It is properly an orphans' asylum, only it must be understood that the word orphan is to be taken in its most extensive sense; that is to say, children who have lost their father, or their mother, or both their parents are all called orphans. It is the aim of this institution to keep the children confided to its care away from their former associates. Children above the age of 10 years are admitted, and in many instances they are younger. They receive full elementary instruction, and are then instructed in the higher branches of education pertaining to the trade which they have chosen.

The shops connected with this school are—joinery, cabinetmaking, wood carving, gilding, machine, watchmaking, gold and silver smithing, printing (typography), for the manufacture of instruments of precision, and bronzing. The course of instruction covers eight years and sometimes longer, as they do not leave the school until they have reached the nineteenth year of age. In 1892 there were 27 teachers and about 450 pupils. The income from contributions to this school is about 65,000 lire ($12,545). The state contributes 18,000 lire ($3,474), the province 6,000 lire ($1,158), the city 10,000 lire ($1,930), the chamber of commerce 1,500 lire ($289.50), benevolent associations 7,000 lire ($1,351), workingmen's associations 11,500 lire ($2,219.50), and private donations 11,000 lire ($2,123). Besides this the school earns something from the sale of articles there manufactured.

Scuola di Lavoro della Società per l'Educazione del Popolo, also in Naples, is a good school, but its resources are limited, the entire income being only about 9,000 lire ($1,737), of which the state furnishes 3,000 lire ($579), the city 4,000 lire ($772), and the society 2,000 lire ($386). The course covers five years. They have 16 poorly paid teachers at an average of 370 lire ($71.41) a year, and claim to have about 230 pupils. At the time of visitation in 1892 they did not seem to have so many, but that may have been caused by the many branches of industry in which instruction was given. There were silversmiths, machinists, joiners, cabinetmakers, wood carvers, wood turners, gilders, model makers, electrical apparatus makers, smiths, locksmiths, bronzers, printers, and bookbinders. The majority appeared to be employed in typography and bookbinding. Their work was not very good.

There are three other schools for males in Naples which were not visited. They are scientific rather than practical. The agent of the Department was informed that these three schools, together, did not have more than six teachers, and that the pupils, nearly all of whom

were already finished workmen or apprentices in their last year, did not exceed the number of 50. The names of the schools are—*Scuola di Chimica Applicata alle Arti della Società Centrale Operaia Napolitana*, laboratory for smelting; *Scuola di Meccanica Pratica per gli Operai presso la Reale Università*, school for the manufacture of instruments of precision; *Stazione Sperimentale per la Industria delle Pelli*, school for experiments in dyeing.

A free school for females in Naples, called *Scuola Gratuita del Ritiro di Suor Orsola*, bears an excellent reputation. Twenty-nine nuns are employed as teachers and the pupils number about 600. This is an entirely charitable institution for the poor. The theoretical instruction is of the grammar school grade. Besides this practical instruction is given in sewing, embroidery, artificial flower making, and knitting and crocheting. The course covers five years, nine months' instruction per year being given; and the cost of maintaining the school is 30,000 lire ($5,790) a year, of which the state pays 17,000 lire ($3,281), the remainder being paid by a religious order.

There exists in Naples a similar school called *Scuola Professionale Femminile nel Ritiro del Santissimo Ecce Homo.*

In Sicily the following schools exist in which some attention is paid to industrial education: At Girgenti the *Scuola d' Arti e Mestieri Gioeni*, a small orphans' asylum with a shop for locksmiths and cabinetmakers; at Trapani the *Scuola d' Arti e Mestieri*, a middle sized orphans' asylum with shops for wood carvers, marble cutters, and workers in lava, seashells, and corals; and at Palermo the *Museo Artistico Industriale e Scuole Officine*, a small asylum with a shop for cabinetmaking only.

In Reggio di Calabria is a school which is theoretical rather than practical, much time and attention being devoted to drawing, and only a little modelling in clay being done.

In the Abruzzo and the Apulia divisions at Chieti and Bari very little of educational interest or importance exists, Bari having only a commercial school for mineralogy and assaying, and Chieti a very small school (*Scuola d' Arti Applicata all' Industria*) with about 30 pupils, and a shop for wood carving, wood turning, and cutting for tailors. There is a still smaller school for girls at Chieti in which industrial instruction is confined to knitting with machines.

At Aversa, near Naples, is the *Scuola d' Arti e Mestieri nell' Istituto Artistico di San Lorenzo.* This school can not be considered a school for boys, as advanced apprentices, young workingmen, and even older students are admitted. There are 9 teachers and about 200 pupils. The instruction is confined to two hours in the morning and three hours in the evening. The shops are for joiners and cabinetmakers, blacksmiths and locksmiths, gilders, wood carvers, shoemakers, tailors, weavers, machinists, printers, and hatters. This school, in which instruction is free, requires an expenditure of 9,000 lire ($1,737) per year, of which the state provides 7,000 lire ($1,351) and the province 2,000

lire ($386). Whatever is manufactured here is sold in Naples, but the receipts are divided among the pupils.

The *Scuola d'Incisione sul Corallo, e d'Arti Decorative e Industriale* at Torre del Greco, seven miles southeast of Naples, is an interesting establishment, as it is from here mainly that the stores and itinerant venders, not only of Naples but of all Italy nearly, are furnished with the so-called "mementos of Italy." All kinds of work in coral, lava, sea-shells, tortoise-shell, ivory, wood, metal, etc., are made here. There are but 4 teachers and about 140 pupils. The course of instruction covers five years. The school has an income of about 10,000 lire ($1,930), which are contributed by the state, the province, the municipality of Naples, the chamber of commerce, etc. This school resembles what in Austria would be called a school for house industries.

At San Giovanni a Teduccio, a suburb of Naples, is located the *Scuola di Disegno Industriale ed Elementi di Meccanica.* Instruction in this school approximates the manual training system. There is a small shop connected with the school where the practical rudiments of metal working are taught. No workingmen are graduated; boys are simply prepared to adopt later on some trade in the line of metal working. There are 8 teachers in all, who have charge of 40 pupils. But very few graduate, as, for instance, at the beginning of the past school year 57 pupils were entered; during the year 5 had to be dismissed for utter moral worthlessness, 12 dropped out, and only 26 passed on examination. The financial support given to this school is limited, reaching only 8,000 lire ($1,544) in all, of which the state grants 3,200 lire ($617.60), the province 2,000 lire ($386), the municipality of Naples 1,600 lire ($308.80), and the chamber of commerce 1,200 lire ($231.60). This school has existed only about six years, but the results are not gratifying to the heads of the institution, and if improvement does not ensue the school may possibly be closed.

The *Scuola Professionale*, at Foggia, was established by the state as far back as 1872, but deteriorated while under state management. The school then passed under the control of the local authorities and is now in a flourishing condition. There are 7 regular teachers with about 100 pupils. There are shops for wood working of every description, including carpentry and wagon making, shops for harness and saddle making, stone cutting, etc., making it one of the best and most completely appointed schools in Italy. The course covers five years. The state grants a subsidy of 1,000 lire ($193) per annum, while the chamber of commerce contributes yearly the amount 38,000 lire ($7,334), and an additional 9,000 lire ($1,737) are contributed by the province, the city, and private parties. This is really a pay school, but poor scholars are not only admitted free of charge, but are also allowed a subsidy to defray their maintenance.

Rome contains but few schools in which industrial instruction is given. Not more than seven such schools are of sufficient import-

ance to be noted, all of which are orphan asylums, and either self-supporting or supported by some religious order.

The *Istituto Professionale Maschile dell' Ospizio di San Michele a Ripa*, at Rome, is a very old school (over one hundred years old), and is connected with an orphan asylum and a home for the aged. It is supported entirely by public charity. It has about 140 scholars, who, once entering, must stay till they are 19 years old. Before being admitted to any of the shops the pupils must have acquired an elementary education reaching as high as perhaps the fourth grade with us. Therefore the scholars are admitted at 10 to 14 years of age, but not over 14. Here, as well as in the majority of these schools, great attention is devoted to art, and to those trades which may be termed artistic. The artistic shops are—wood carving, copper plate engraving, stucco work, decorative painting, architectural draughting, and tapestry. The trade shops are for stone and marble cutting, joinery and cabinetmaking, blacksmiths and locksmiths, machinists, printing, and metal casting. The great majority of the pupils adopt here as everywhere else in meridional Italy the line of the arts. The school authorities, however, have no record of the career of the pupils after they leave school.

The *Istituto Pio IX degli Artigianelli di San Giuseppe*, Rome, is the exact counterpart of the preceding one, with the only exception that this school is in charge of the Christian Brothers, while the former is in charge of the laity. There are about 100 pupils, who may enter at 10 years of age and upward. This school admits also pay scholars at the rate of 35 lire ($6.76) per month, for which sum they are fed, clad, housed, and instructed. The branches of instruction are the same as above, with the exception that decorative painting and architectural draughting drop out, and that shoemaking and tailoring are added. This school also exists entirely from the sale of its products and the contributions of the order.

Ospizio di Tata Giovanni, Rome, is in charge of the priesthood. It is an orphans' asylum, rather small, with about 60 pupils who receive a religious and theoretical education in the house, where they are also fed and clad; but the practical trade education is not imparted in the house. The priests, however, procure apprenticeships outside for the boys.

The system seems to work well, for it has been adopted by the *Scuola Professionale del Rione San Angelo*—a school established by Israelites who pick up little erring and wandering Jews, apprentice them somewhere, and instruct them in the Hebrew faith.

Ospizio degli Artigianelli Bonanni is an orphans' asylum similar to the *Istituto Professionale Maschile dell' Ospizio di San Michele a Ripa* and the *Istituto Pio IX degli Artigianelli di San Giuseppe*, but very much smaller and supported entirely by the working classes.

The Victoria Home, Rome, is a school that rests upon a charitable

foundation. A memorial tablet upon the building bears the following inscription: "In memory of Margueretta Leslie Edwardes, who for sixteen years labored with untiring love and zeal for the good of the children of Italy. Died July 12, 1891." The school is now conducted by the daughter of the deceased. There are about 40 pupils (both male and female). Pupils are admitted at a very tender age, in fact when they can walk, and stay till they are 14 years of age, when situations are procured for them. The girls are taught household work, including sewing, knitting, crocheting, etc. The boys are educated to become printers and bookbinders, or shoemakers. The printing done, considering the very old and very poor material, is good. The children are fed, clad, and housed, as a rule, without charge, but there are Italian families who desire to send their children there and are willing to pay. The charge is then 400 lire ($77.20) per annum.

The *Scuola Femminile Torlonia* in Rome is supported entirely by the munificence of Prince Torlonia, and is conducted on the convent school plan. The instruction is of a high grade, and in ornamental rather than industrial branches. Pupils are admitted after a very rigid examination, not only as to their personal conduct, but also as to the antecedents of their parents. Among the inhabitants of Rome the school stands high in esteem.

CHAPTER VIII.

PRESENT STATUS OF INDUSTRIAL EDUCATION IN RUSSIA.

CHAPTER VIII.

PRESENT STATUS OF INDUSTRIAL EDUCATION IN RUSSIA.

Russia has no national system of elementary instruction—such school organization as exists in Finland, Poland, and the Baltic dependencies being of local and provincial origin. The government is understood, however, to have under consideration a scheme for promoting primary education. Meanwhile many of the manufacturers have established schools in connection with their works, and most railway companies maintain similar schools for the benefit of the children of their employés. The government also takes the utmost pains to promote the interests of manufactures and mechanical pursuits generally, by founding and subsidizing technical schools of a high order.

The imperial technical schools at Moscow and Saint Petersburg are richly endowed, and are reputed to be among the best equipped of European schools of their class. But these are properly classed as professional schools.

Of the schools below the university rank in Moscow, which give manual instruction and yet make no attempt to teach a handicraft, the Komisarof Technical School is among the oldest and best. It was opened in 1866; two railroad contractors having originated the scheme for its establishment. The institution is aided by the government, and is attended by about 400 students. Boys are admitted at 11 years of age, if qualified, and remain five years.

The course of instruction by years is as follows:

First year.—Reading, writing, arithmetic to common fractions, grammar, German, geography, and drawing.

Second year.—Same subjects continued, Latin, Russian history, mathematical and mechanical drawing, and map drawing; workshop practice three hours daily.

Third year.—Some of the above subjects, algebra, physical geography, free-hand drawing, geometry, and conic sections.

Fourth year.—Mechanics, dynamics, history, elementary physics, mineralogy, and metallurgy.

Fifth year.—Trigonometry, magnetism and electricity, physics, properties of metals and woods, composition of stones, lime, mortar, machine construction, hydraulics, and bookkeeping.

The elements of botany and zoölogy are taught in all the classes.

Carpentry constitutes the workshop practice of the second and third years. Subsequently metal work takes the place of it. The equipment

of the workshops comprises 44 vises, 60 carpenters' benches, 30 foot lathes, 4 forges, etc.

Of the same kind, though on a smaller scale, is the Mechanical Handicraft School of Moscow, founded by the Society for the Promotion of Technical Education. The instruction is much like that of the school just described. The government contributes about $1,000 annually to the support of this school. The course of study requires five years for its completion. Boys enter the school at 12 years of age.

The Strogonoff School of Technical Design and Museum of Art and Industry was founded in 1860 by Count Strogonoff in conjunction with the Emperor Nicholas. Drawing, modelling in clay, and designing of fabrics are the principal subjects of instruction. The Museum of Art and Industry, established in connection with this school, is characterized by Mr. Mather as "a sort of South Kensington in embryo."

Like Moscow, Saint Petersburg has its technological institute and other institutions of collegiate rank for the education of civil engineers, mining engineers, etc. But the city is also abundantly provided with secondary schools which do not train pupils for professions or specialties. Foremost among these is the Saint Petersburg Handicraft and Industrial School. This school is the outcome of an undertaking begun many years ago by the town authorities, with the aid of private individuals, and under the patronage of the imperial family, having for its object the education of poor boys and orphans in the mechanic arts. Boys enter this school at the age of 12 years, and pursue a five years' course.

The studies comprise reading, writing, arithmetic, the Russian language, history, geography, natural history, elementary chemistry, mechanics and physics, technology of metals and woods, free-hand drawing, mechanical projection, singing, and gymnastics. Joinery, bootmaking, engraving, paper hanging, smiths' work, turning, planing, and shaping of metals constitute the various branches of workshop practice.

The teaching staff numbers 24 persons, 2 of whom are drawing teachers, and 3 teach the handicrafts.

In the first two years pupils spend two hours in the workshop and five hours in the classes daily; in the third and fourth years the time is about equally divided between the classes and the workshop; while, in the fifth year, the whole of each day is passed in the shop.

In connection with this school is a girls' department conducted on the same general plan. There are 19 teachers, of whom 9 are teachers of handicrafts. Girls are admitted at 10 to 12 years of age, and remain until 17. In addition to elementary book learning they are taught the cutting out of clothing, needlework, dressmaking and millinery, lace making, cooking and housekeeping.

At the Munich congress (1888) Saint Hilaire, director of the seminary at Saint Petersburg, said in reference to the state of the work school

movement in Russia, that great interest had been taken in manual training in Russia ever since the efforts of Clauson-Kaas in Germany had become known. He further declared that the Technical Society of Saint Petersburg had for ten years sought to promote manual training; but that the greatest impulse had been given to this form of instruction by the present minister of finance, Mr. Wischnegradski. In 1884 he made a journey to Sweden, and visited the seminary of Salomon at Nääs. During the same summer the minister of education sent two teachers to Nääs, in order that they might go through the six weeks' course there; and, later, the director of the teachers' institute at Saint Petersburg was dispatched to Sweden and Germany to ascertain what were the most approved equipments of manual training shops.

In the same year (1884) a workshop for boys' hand labor was established in connection with the teachers' institute at Saint Petersburg by the minister of education, and one of the teachers, Mr. Zizuhe, who had worked in the Nääs seminary, was appointed (and had since served) as superintendent of this establishment. In the year 1885 the council voted an annual sum of 3,000 rubles ($1,659) for the workshop.

The method of wood working pursued by Director Salomon at Nääs had been adopted with but slight and unimportant modifications, and also within the past year (1887) a beginning in metal work had been made. Each year about 45 pupils of the teachers' institute, who are preparing for positions in the city schools, take the course, and about 20 pupils of the practice school—boys from 12 to 15 years of age—also attend. They are divided into four groups and each group has to perform six hours' shop work per week.

Many of the pupils who have completed the manual training course (*Handfertigkeits-Cursus*) are already introducing hand labor for boys into other educational establishments in Saint Petersburg, in the provinces, and throughout Russia. Very many teachers and young people, including women, apply for admission to the school workshop, and it is impossible to accommodate all of them. The teachers also give many private lessons in manual training in well to do families and in families of the highest station. During the present summer (1888) three courses in manual training have been held in Russia, viz., in Novaia Ladoga, for city and country school teachers, led by School Inspector Kotikof, a pupil of the Nääs seminary; a course at Riga under the direction of Mr. Zizuhe; and a course for country school teachers at Kiev. All of these courses have received subventions from the state.

Manual training has made good progress in Russia of late. The first institution which adopted this special instruction into its curriculum was the teachers' institute at Saint Petersburg, and it is still at the head of the movement.

Not only do the future teachers there learn to practise their profession, but many teachers already in office are sent thither from various

provinces of the kingdom to graduate in its courses of instruction. For carrying out this course of teaching 3,000 rubles ($1,659) are annually appropriated for the benefit of the Saint Petersburg teachers' institute. Similar provision is made for instructing teachers in manual labor at the institutes in Glookhov, Vilna, and Orenboorg.

Besides, there are now eleven teachers' courses held in various localities in Russia during the vacation season, and by this means 250 teachers are prepared for the work of imparting manual instruction every year. Furthermore, the Russian minister of war has decided to introduce manual training into all cadet schools; and, accordingly, in the summer of 1891, he instituted at Saint Petersburg a course of instruction for officers from all cadet corps.

Altogether, manual training has, up to the present time, been introduced into 116 establishments, viz., 4 teachers' institutes, 14 teachers' seminaries, 4 intermediate schools, 16 cadet corps, 44 higher public schools, and 34 elementary and common schools.

In the Russian congress of manual training in 1890 it was resolved: (1) That manual training should be recognized as a general educational subject; (2) that the most effectual means of educating teachers of manual training are the vacation courses of instruction; (3) that in order to insure the adoption of manual training in all teachers' institutes and seminaries the government should make it an obligatory subject.

FINLAND.

The data are not at hand from which to sketch an outline of the industrial educational system of Finland. The following extracts from the *Statistisk Årsbok för Finland*, 1889–'90, show, however, that such a system exists in that country.

Seven commercial schools are reported, with 46 male and 11 female teachers, and with 297 pupils—162 boys and 135 girls. These schools all receive state subsidies.

Thirty-one schools for apprentices, with a total of 2,111 pupils, are also mentioned, all receiving subventions from the town and state.

There are 12 agricultural schools, with 44 instructors and 279 students. The course of study in these schools occupies two years in some cases and three years in other. Then there are 16 dairy schools, with 25 male and 16 female teachers, and 148 pupils, all but one of whom are females.

Of industrial schools there were 6 in Finland, with 37 teachers and 255 pupils, at the end of the school year 1888–'89. In certain of these schools the Finnish language is used, in others the Swedish. The schools derive their support from tuition fees.

Finally, there were 12 towns in which 16 trade schools were maintained. The teachers in these schools numbered 68, the pupils 965, varying in age from 11 years to 40. The state and commune contribute

to their support. The report gives no clue as to what trades are taught, or what is the nature and scope of the instruction in any of the Finnish schools.

Helsingfors, the capital of Finland, is the site of a polytechnic school which bears an excellent reputation. It has five sections, viz., engineering, machine construction, architecture, chemistry, and surveying. The total number of pupils in attendance during the school year 1890–'91 was 128.

There are also several schools in Finland where navigation is taught. Seven such are named in the list of the *Årsbok*. The total number of pupils in the seven schools in the school year 1890–'91 was 156.

Nine commercial schools are given in the list of industrial institutions of Finland. These have, altogether, 62 teachers and 443 pupils—247 males and 196 females.

The number of agricultural schools in Finland has increased from 12 (as enumerated in the *Årsbok, 1889–'90*) to 14, the present number. In the aggregate there are now 51 instructors in these schools and 362 students. The dairy schools have apparently grown in favor with the people also. Of these there are now 19 in Finland, with 20 male and 26 female teachers, and 177 pupils, all females.

There are trade schools of the primary grade in existence in 13 towns of Finland, with 58 teachers, 632 Finnish speaking pupils, 73 whose mother tongue is Swedish, and 9 whose native language is neither Swedish nor Finnish. As to age the youngest is 11, the eldest 33. Total state subvention, 4,774 marks ($1,136.21); communal, 8,099 marks ($1,927.56).

There are also trade schools of the superior grade in 6 towns, with 37 teachers, 251 Finnish speaking pupils, and 27 Swedish speaking pupils. As to age the minimum is 11 years, the maximum, 39 years. The state subvention is 10,755 marks ($2,559,69); communal, 17,006 marks ($4,047,43).

In this report (*Årsbok, 1892*) there are no statistics concerning the industrial schools of Finland that come down to a later date than those contained in former annuals. Indeed the figures from the report of 1889–'90 are here reproduced without change.

Except in the case of the Polytechnic School at Helsingfors statistics are not given respecting individual institutions, and the information as to the polytechnic is very meagre.

Following is a census of the Finnish technical and industrial schools:

TECHNICAL AND INDUSTRIAL SCHOOLS IN FINLAND.

Marginal number.	Name of school.	Location.	Curriculum.
	Lower technical schools.		
1	Helsingfors technical school.	Helsingfors	Penmanship, bookkeeping, mathematics, physics, practical mechanics, machine construction, free-hand, mechanical, and trade drawing, bridge, road, and water engineering, and manual work.
2	Åbo technical school	Åbo	Same as No. 1, and, in addition, ship building.
3	Tammerfors technical school	Tammerfors	Same as No. 1
4	Kuopio technical school	Kuopio	Same as No. 1
5	Nikolaistad technical school.	Nikolaistad	Same as No. 1, and, in addition, chemistry.
	Elementary technical schools.		
6	Tammerfors elementary technical school.	Tammerfors	Free-hand, ornamental, trade, and mechanical drawing, mathematics, penmanship, history, bookkeeping, Swedish and Finnish languages.
7	Åbo elementary technical school.	Åbo	
8	Viborg elementary technical school.		
9	Uleåborg elementary technical school.	Uleåborg	
10	Björneborg elementary technical school.	Björneborg	
11	Jyväskylä elementary technical school.	Jyväskylä	
12	Kotka elementary technical school.	Kotka	
13	Raumo elementary technical school.	Raumo	
14	Saint Michel elementary technical school.	Saint Michel	
15	Jacobstad elementary technical school.	Jacobstad	
16	Ekenäs elementary technical school.	Ekenäs	
17	Torneå elementary technical school.	Torneå	
18	Kexholm elementary technical school.	Kexholm	
19	Mariehamn elementary technical school.	Mariehamn	
	Industrial schools.		
20	Wasa practical school	Nikolaistad	Drawing, modelling, carpentry, and blacksmith work.
21	Uleåborg practical school	Uleåborg	Carpentry, lathe work, wood sculpture, basket making, drawing, and modelling.
22	Makarne Halloublads industrial school.	Sordavala	Work in wood and iron, drawing, and modelling.
23	Lektor Mäkineus practical school.	Sordavala	All kinds of carpenter work, free-hand, ornamental, and trade drawing.
24	Säkkijärvi industrial school.	Säkkijärvi	Carpenter, blacksmith, and tinsmith work, free-hand and trade drawing.
25	Joensuu industrial school	Joensuu	Carpenter work
26	Ingman's industrial school	Åbo	Fancy work in wood and wood sculpture.
27	Willmanstrand industrial school.	Willmanstrand	Carpenter work, harness making, drawing, and arithmetic.
28	Hattula industrial school	Hattula	All kinds of wood work
29	Satakunta industrial school.	Tuiskula	Blacksmithing, wagon making, and agricultural implements.
30	Imperial Finnish industrial school.	Åbo	Weaving, sewing, straw work, drawing, and bookkeeping.
31	Borgå weaving school	Borgå	Weaving, knitting, sewing, and straw work.
32	Borgå school for straw workers.	Borgå	Straw work of all kinds, and basket making.
33	Tavastehus work school	Tavastehus	Weaving, dyeing, and sewing
34	Kuopio school of weaving	Kuopio	Weaving, dyeing, and sewing

TECHNICAL AND INDUSTRIAL SCHOOLS IN FINLAND.

How supported.	Courses.	Fees (approximate).	Total pupils.	Marginal number.
rnment, county, and fees	One and two years	$4 per year	54	1
rnment, county, and fees	One and two years	$4 per year	32	2
rnment, county, and fees	One and two years	$4 per year	40	3
rnment, county, and fees	One and two years	$4 per year	25	4
rnment, county, and fees	One and two years	$4 per year	10	5
ernment, county, and fees	Six months each	$2 per course	955	6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19
rnment, county, and fees	Six months each; twelve hours daily.	54 cents per month	20	20
rnment, county, and fees	Six months each	70 cents per month	20	21
rnment, county, and fees	Eight months each; ten hours daily.	60 cents per month	17	22
rnment, county, and fees, and vate donations.	One year each; twelve hours daily.	80 cents per month	15	23
rnment, county, and fees, and vate donations.	Four months each; thirty-four hours per week.		15	24
rnment, county, and fees, and vate donations.	Six months each	40 cents per month	40	25
rnment, county, and fees, and vate donations.		40 cents per month	33	26
rnment, county, and fees, and vate donations.	Eight months each		20	27
rnment, county, and fees, and vate donations.	Two years	80 cents per month	15	28
rnment, county, and fees, and vate donations.	One year		50	29
rnment and private donations, s.	No fixed time	40 cents per month	60	30
rnment and private donations, s.	No fixed time	40 cents per month	30	31
rnment and private donations, s.	No fixed time	40 cents per month	30	32
rnment and private donations, s.	No fixed time	40 cents per month	60	33
rnment and private donations, s.	No fixed time	60 cents per month	65	34

TECHNICAL AND INDUSTRIAL SCHOOLS IN FINLAND—Concluded.

Marginal number.	Name of school.	Location.	Curriculum.
	Industrial schools—conc'd.		
1	Joensuu school of weaving.	Joensuu	Weaving, dyeing, and sewing
2	Saint Michel school of weaving.	Saint Michel	Weaving, dyeing, and sewing
3	Uleåborg school of weaving	Uleåborg	Weaving, dyeing, sewing, and drawing.
4	Rovaniemi school of weaving.	Rovaniemi	Weaving, dyeing, sewing, and drawing.
5	Kajana school of weaving	Kajana	Weaving, dyeing, sewing, and bookkeeping.
6	Kexholm school of weaving.	Kexholm	Weaving, dyeing, sewing, and bookkeeping.
7	Fredrikshamn school of weaving.	Fredrikshamn	Weaving, dyeing, sewing, and bookkeeping.
8	Satakunta school of weaving	Satakunta	Weaving, dyeing, sewing, and bookkeeping.
9	Central school of art industry.	Helsingfors	Free-hand, ornamental, architectural, and mechanical drawing, trade drawing, arithmetic, mathematics, bookkeeping, ornamental modelling, porcelain and flower painting, wood sculpture and wood engraving, metal work, and penmanship.

TECHNICAL AND INDUSTRIAL SCHOOLS IN FINLAND—Concluded.

How supported.	Courses.	Fees (approximate).	Total pupils.	Marginal number.
By government and private donations, and fees.	No fixed time	40 cents per month	15	1
By government and private donations, and fees.	No fixed time	40 cents per month	30	2
By government and private donations, and fees.	No fixed time	40 cents per month	100	3
By government and private donations, and fees.	No fixed time	55 cents per month	85	4
By government and private donations, and fees.	No fixed time	40 cents per month	64	5
By government and private donations, and fees.	No fixed time	40 cents per month	38	6
By government and private donations, and fees.	No fixed time	60 cents per month	92	7
By government and private donations, and fees.	No fixed time	40 cents per month	101	8
By state, private donations, and fees.	One to three years	$2 per term	364	9

TECHNICAL AND TRADE EDUCATION.

The following review of the present condition of middle and lower grade technical and trade education in Russia is derived from a work (*a*) on that subject by J. A. Anapoff of Saint Petersburg, portions of which have been specially translated for this Department. This, we are informed, is the only work of a statistical nature relating to this subject.

Technical and professional education in Russia, in the current restricted sense of the terms, is of comparatively recent origin, for, though the government had previously given some attention to general education, it was not till within the last twenty-five years that measures were adopted for the promotion of special education, except in the two government schools—the Saint Petersburg Technological Institute and the Imperial Technical Institute at Moscow, both of which have since attained to the rank of universities.

Twenty-five years is too short a period for the full development of any scheme of public education; nevertheless the following data may serve as a proof of the great progress of professional education throughout Russia within the two and a half decades to which this report relates. This progress is attributable chiefly to the aid granted by the government, the communes, and by private munificence. The financial assistance extended by individual benefactors to newly established technical and professional schools has sometimes been quite large, and the ministry of finance, in whose care these institutions were placed up to 1881, also rendered essential service in their development.

The permanent establishment of new schools and the large increase of their number showed the necessity of forming a general plan of technical and professional education, which was finally formulated by the ministry of finance, in accordance with an imperial order, in 1878.

In 1881, in obedience to an imperial decree, most of the schools were placed under the superintendence of the ministry of public instruction. By this order the authority to organize a system of public education was vested in the ministry of public instruction; and, pursuant to the plan, the committee of the scientific department organized a special section of technical and professional education.

a Review of the Present Condition of Middle and Lower Technical and Trade Education in Russia, by J. A. Anapoff, director of the Tsarevitch Trade School, member of the section of the scientific committee on technical and professional education, and assistant to the president of the permanent committee on technical education attached to the Imperial Russian Technical Society. Saint Petersburg, 1889.

The fundamental regulations of such schools were imperially confirmed in 1888, the minister of public instruction being ordered, in conjunction with the minister of finance and of the interior, to determine the places where such schools should be opened at the expense of the government.

The new statutes (1888) relating to real-gymnasia provide for closing the special additional sections (except the commercial), and, instead of them, opening different government industrial schools, viz., the middle technical, lower technical, and trade schools.

This review relates only to those schools established for training specialists in trade works and manufacturing industries; that is, those which were opened between 1860 and 1870, but which have not yet yielded definite results.

All these technical and trade institutions may be assigned to the five following groups:

(1) Technical schools, with a course of studies similar to those pursued in middle educational institutions (classic and non-classic gymnasia, commercial schools, etc.), which resemble the non-classic gymnasia, but differ from them by a greater attention to technical subjects. The object of these schools is to give pupils (in six to eight years) a general education, and such technical knowledge as they will need as assistants to engineers. The graduates of such schools have the right of entering the high special schools (technological institutes, etc.) as permitted the graduates of classic and real (non-classic) gymnasia, and as to military service have also the same rights as these latter. The scholars, besides receiving general instruction in classes, work in mechanical shops or in chemical laboratories. To this group belong, strictly speaking, only three schools—the High Trade School in Lodz, the Irkootsk Technical School, and the Komisarof Technical School in Moscow. The Omsk and Kungursk technical schools are partly of this class, and are therefore included in this group.

(2) In the second group may be classed those schools whose curricula equal those of town schools (grammar schools). For those entering them the knowledge of the subjects included in the curricula of primary schools is necessary, the full course of study being from four to six years; for military service their pupils have rights of the third degree (*i. e.*, serve in regular service three years as privates), excepting the pupils of Tsarevitch Nicholas Trade School of Saint Petersburg, whose rights in this respect are higher. The curricula do not exceed those of the town schools, but these additional branches are studied—physics, mechanics, and technology of wood and metals. Such schools

are established to train master workmen, junior mechanics, machinists, and tracers. Graduates of such schools have not the right of entering high schools, although the extent of the curricula of some of them develops in the scholars a desire to continue their education. In most of the schools they follow a strict course of instruction in locksmiths' and joiners' trades, which makes their maintenance quite expensive; when there are no other financial resources the scholars are educated on the income derived from the sale of pupils' work and from the fulfilment of private orders. Many of the graduates enter as teachers of trades in lower schools, and in this way the schools of this group, not being intended for preparing trade teachers and not having any special class for such purpose, nevertheless necessarily resemble trade school seminaries; many of them are provided with boarding facilities. To such schools belong the Alexander Technical in Cherepovetz, the Count Orloff-Demidoff Trade School in Simbeersk, and the trade school of Tsarevitch Nicholas in Saint Petersburg. In this group it is necessary to include the technical railway schools, superintended by the ministry of ways and communications, but as they pursue only special courses, restricted to the needs of employment upon railways, we will not describe them.

(3) Trade (*remessleni*) schools with curricula not higher than those of primary schools, or sometimes reaching that of two-class village schools. Most of them accept graduates of public (peasant) schools and repeat the programme of the latter. Such schools are established for the purpose of training masters in the common trades, and also workmen. They have shops for joiners, blacksmiths, carpenters, locksmiths, shoemakers, bookbinders, and other trades, but these schools do not all furnish systematic instruction in trades. In summer the scholars mostly do manual work in the shops; most of these schools are without boarders. This group includes the Kazan, Orenboorg, Kishenev, Irbit, and other trade schools; it should also include the trade schools established by benevolent societies as in Vladimeer, Tver, and other towns, and also such trade shops as at the Tambov and Birsk trade schools.

(4) To this group belongs different special schools of general education for adults, such as the school of overseers of architecture, the printing school, the evening and Sunday special classes of the technical society of Saint Petersburg, Riga trade schools, and others. The instruction is given during the evenings when the workmen have leisure time. The graduates of such schools have the right of third and fourth degree for military service, according to the degree of their education.

(5) The general educational low schools, that is, non-technical, non-trade, which embrace the primary, district (county) or town schools, with additional trade sections.

In respect to the foregoing classification of technical and trade schools it is necessary to add that the line of separation between the groups can not be quite definite, for these various schools merge into one another. A list of the schools in the several groups, together with the number of students and graduates and the cost of support and studies, follows:

STUDENTS AND GRADUATES OF THE MIDDLE AND THE LOWER TECHNICAL TRADE SCHOOLS.

Marginal number.	Name of school.	Year established.	Students during the last school year.								
			Locksmiths.	Joiners.	Founders.	Engravers.	Blacksmiths.	Turners.	Shoe and harness makers.	Bookbinders.	[illegible]
	First group.										
1	Lodz high trade	1869	.....	.....	.....	.....	.....	.....	.....	.....	.....
2	Irkootsk technical	1873	.....	.....	.....	.....	.....	.....	.....	.....	.....
3	Komisarof technical in Moscow.	1865	.....	.....	.....	.....	.....	.....	.....	.....	.....
4	Omsk technical	1882	.....	.....	.....	.....	.....	.....	.....	.....	.....
5	Kungursk technical of Mr. Guboniov.	1877	33	1	.....	.....	.....	.....	.....	.....	.....
	Total of the first group	.....	33	1	.....	.....	.....	.....	.....	.....	.....
	Second group.										
6	Cherepovetz Alexander technical.	1868	.....	.....	.....	.....	.....	.....	.....	.....	.....
7	Simbeersk trade	1868	139	15	.....	.....	.....	.....	.....	.....	.....
8	Tsarevitch Nicholas trade	1875	269	66	.....	.....	.....	.....	.....	.....	.....
9	Kulibinsk (Nizhnee Novgorod) trade.	1872	50	27	.....	7	.....	.....	.....	.....	.....
10	Tiflistown Michailovsk trade.	1880	106	70	29	.....	.....	.....	.....	.....	.....
11	Vladimeer Maltzef trade	1885	*a* 71	3	.....	.....	.....	.....	.....	.....	.....
12	Vladi Kavkas Ct. Loris Mellikof trade.	1868	48	26	.....	.....	.....	.....	.....	.....	.....
13	Saratov Alexander trade	1871	108	32	.....	.....	.....	.....	.....	.....	.....
14	Degtiaref trade	1878	60	42	7	.....	10	.....	.....	.....	.....
15	Putivl Maklakof trade	1886	40	12	.....	.....	.....	.....	.....	.....	.....
16	Stavropol Michailof trade	1872	37	11	.....	.....	.....	.....	.....	.....	.....
17	Saint Petersburg technical society's trade.	1879	52	26	.....	.....	.....	.....	.....	.....	.....
18	Gnedinsk trade	1883	12	10	.....	.....	12	.....	.....	.....	.....
19	Odessa Jew society (Labor) trade.	1874	110	29	27	.....	.....	.....	.....	.....	.....
20	Michailof-Elisavetpol professional.	1883	.....	29	.....	.....	85	.....	.....	.....	.....
21	Kharkov trade	1886	53	32	.....	12	2	25	.....	.....	.....
22	Bolshesolsk-Popoff trade	1879	36	6	.....	.....	.....	.....	.....	.....	.....
23	Okhta (suburb of Saint Petersburg) trade.	1877	34	64	.....	.....	.....	.....	9	.....	.....
24	Dünaburg Jew trade	1887	38	18	.....	.....	.....	.....	.....	.....	.....
25	Warsaw Konarsky trade	1885	.....	.....	.....	.....	.....	.....	.....	.....	.....
26	Moscow technical society's trade.	1873	.....	.....	.....	.....	.....	.....	.....	.....	.....
27	Moscow Morosoff trade	1877	48	22	.....	.....	.....	.....	.....	.....	.....
28	Novo-Cherkask Attsman trade	1886	.....	.....	.....	.....	.....	.....	.....	.....	.....
	Total of second group	.....	1,311	540	63	19	59	25	9	.....	.....
	Third group.										
29	Kazan trade	1881	63	35	.....	.....	.....	.....	38	.....	1
30	Riazan trade	1875	33	13	.....	26	.....	15	.....	16	.....
31	Tver trade	1877	17	17	.....	.....	.....	.....	.....	.....	.....
32	Irbit trade	1877	16	.....	.....	.....	6	.....	11	.....	.....
33	Kishenov trade	1881	27	31	.....	.....	.....	.....	.....	.....	.....
34	Tambov trade modelling shop.	1884	44	29	.....	.....	.....	.....	.....	.....	.....
35	Private trade school of Kin in Warsaw.	1879	141	24	.....	.....	.....	.....	15	.....	.....
36	Orenbsorg trade	1870	13	18	.....	.....	.....	.....	12	.....	.....
37	Tomsk-Koroleff trade	1883	10	4	.....	.....	.....	.....	2	.....	.....
38	Kertch trade	1884	26	19	.....	.....	.....	.....	.....	.....	.....
39	Viatka trade	1888	.....	.....	.....	.....	.....	.....	.....	.....	.....
40	Sakatalsk trade	1882	14	10	.....	.....	.....	.....	.....	.....	.....
41	S. S. trade Co.'s trade	1866	71	.....	.....	.....	.....	.....	.....	.....	.....
42	Harbor of Nicolaef trade	1873	30	27	2	.....	20	23	.....	.....	.....
43	Reshetof Tver trade classes	1875	.....	17	.....	.....	.....	.....	.....	.....	.....
44	Malmisk trade	1877	18	21	7	.....	.....	.....	10	.....	.....
45	Kiev benevolent societies trade	1872	.....	27	.....	.....	.....	4	1	27	.....
46	Baltic works trade	1880	70	.....	.....	.....	.....	.....	.....	.....	.....
47	Smolensk trade	1874	29	12	.....	.....	7	.....	.....	.....	.....

a All the students of the first class (35) were occupied in the joiners' shop; 21 of the second class in the locksmiths'; and of 18 of the third class 3 chose the joiner's trade.

b The other 49 of the junior class were occupied in more than one trade.

c Of this number 10 were occupied in the cooper's business and 9 in agriculture; of 7 students no information is given.

d Of this number 26 were occupied in church painting and 9 had graduated in this specialty.

AND GRADUATES OF THE MIDDLE AND THE LOWER TECHNICAL AND TRADE SCHOOLS.

Graduates.											Cost of support and studies.	Marginal number.
Lock smiths.	Joiners.	Founders.	Engravers.	Blacksmiths.	Turners.	Shoe and harness makers.	Bookbinders.	Tailors.	Bookkeepers.	Total.		
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	287	$15,484.00	1
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	91	21,014.00	2
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	426	51,982.00	3
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	33	16,590.00	4
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	43	16,590.00	5
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	885	121,660.00	
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	202	25,438.00	6
97	11	.....	.....	.....	.....	.....	.....	.....	.....	108	18,249.00	7
251	57	.....	22	.....	.....	.....	.....	.....	.....	330	58,618.00	8
29	38	.....	11	.....	3	.....	.....	.....	.....	81	7,189.00	9
52	27	1	.....	.....	.....	.....	.....	.....	.....	80	16,590.00	10
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	10,507.00	11
59	56	.....	.....	.....	.....	.....	.....	.....	.....	115	9,954.00	12
93	22	.....	.....	.....	.....	.....	.....	.....	2	117	19,355.00	13
29	47	1	.....	13	.....	.....	.....	.....	.....	90	15,649.90	14
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4,755.80	15
44	17	.....	.....	.....	.....	.....	.....	.....	.....	61	4,424.00	16
79	28	.....	.....	.....	.....	.....	.....	.....	.....	107	4,424.00	17
10	8	.....	.....	11	.....	.....	.....	.....	.....	29	9,401.00	18
57	18	7	.....	.....	.....	.....	.....	.....	.....	82	8,295.00	19
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	14,378.00	20
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7,742.00	21
14	1	.....	.....	.....	.....	.....	.....	.....	.....	15	2,820.30	22
14	13	.....	4	.....	1	4	1	.....	.....	f55	13,825.60	23
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2,543.80	24
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4,147.50	25
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	81	5,605.90	26
44	9	.....	.....	.....	.....	.....	.....	.....	.....	53	3,318.00	27
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	17,143.00	28
872	352	9	37	24	4	4	1	.....	2	1,606	284,463.20	
16	7	.....	.....	.....	.....	5	.....	2	.....	30	3,318.00	29
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	57	9,954.00	30
27	12	1	.....	.....	.....	.....	.....	.....	.....	40	2,765.00	31
20	5	.....	.....	5	.....	6	.....	.....	.....	36	3,539.20	32
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	8	2,986.20	33
19	4	.....	.....	1	.....	.....	.....	.....	.....	24	6,630.00	34
65	3	.....	.....	.....	.....	2	.....	.....	.....	70	5,806.50	35
.....	48	.....	.....	37	.....	19	.....	.....	.....	104	4,811.10	36
6	2	.....	.....	.....	.....	1	.....	.....	.....	9	1,935.50	37
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	5,530.00	38
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	39
11	11	.....	.....	.....	.....	.....	.....	.....	.....	22	3,649.80	40
276	.....	.....	.....	.....	.....	.....	.....	.....	.....	276	2,765.00	41
119	66	11	.....	77	58	.....	.....	.....	.....	h425	4,733.68	42
.....	25	.....	.....	.....	.....	.....	.....	.....	.....	25	.....	43
24	16	3	.....	.....	.....	8	.....	.....	.....	51	4,700.50	44
.....	9	.....	.....	2	.....	3	9	.....	.....	i35	.....	45
101	.....	.....	.....	.....	.....	.....	.....	.....	.....	101	4,147.50	46
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4,977.00	47

mber 9 were occupied in wood and 3 did not study trade.
of the graduates still work in the school shops; of 1 graduate no information is given.
of junior classes do not study trades.
luates no information is given.
; of 12 graduates no information is given.

STUDENTS AND GRADUATES OF THE MIDDLE AND THE LOWER TECHNICAL AND TRADE SCHOOLS—Concluded.

Marginal number.	Name of school.	Year established.	Students during the last school year.								
			Locksmiths.	Joiners.	Founders.	Engravers.	Blacksmiths.	Turners.	Shoe and harness makers.	Bookbinders.	Tailors
	Third group—concluded.										
1	Irkootsk Trapeznikof trade	1874	.....	38	.....	7	7	.....	21	.....	...
2	Massalsk trade asylum of Kanshin.	1874	.....	7	.....	.....	.....	.....	.....	2	...
3	Krasnoslobodsk trade	1885	.....	17	.....	.....	.....	.....	.....	.....	...
4	Birsk trade	1882	.....	20	.....	.....	29	.....	.....	.....	...
5	Penza Shvetzof trade	1884	.....	23	.....	.....	.....	.....	17	.....	...
6	Vilna training shops	1873	26	14	.....	.....	.....	.....	.....	.....	...
7	Turgaisk Jacovleff trade	1883	.....	5	.....	.....	.....	.....	.....	.....	
8	Oofa Alexander trade	1878	.....	28	.....	.....	.....	.....	13	.....	
9	Menkof Sebastopol trade	1887	17	18	.....	.....	.....	.....	.....	.....	
10	Vitebsk town trade asylum	1878	.....	10	.....	.....	.....	.....	7	13	...
11	Tobolsk trade	1876	.....	10	.....	.....	.....	.....	.....	.....	...
12	Kolomna trade	1878	.....	.....	.....	.....	.....	.....	.....	.....	...
13	Astrakhan trade school of the Armenian church.	1877	.....	10	.....	.....	.....	.....	7	.....	...
14	Kobijsk-Savinsk trade classes.	1882	8	8	.....	.....	.....	.....	.....	.....	...
15	Alexandrof trade school in hamlet Kochureshty (Bessarabia).	1887	.....	18	.....	.....	7	.....	.....	.....	...
16	Nogaisk commune trade	1883	7	13	.....	.....	.....	.....	.....	.....	...
17	Matchkask trade	1883	.....	.....	.....	.....	.....	.....	.....	.....	...
18	Sakaaganak commune trade	1877	9	9	.....	.....	.....	.....	.....	.....	...
19	Chineseutsk trade	1884	.....	.....	.....	.....	.....	.....	.....	.....	...
20	Kotelnichesk Komisarof trade.	1871	6	2	2	.....	4	1	.....	.....	...
21	Suisk trade	1887	3	3	.....	.....	.....	.....	.....	.....	...
22	Chembarsk commune trade	1875	.....	7	.....	.....	.....	.....	.....	.....	...
23	Pskov trade	.....	.....	.....	.....	.....	.....	.....	.....	.....	...
24	Samara Alexander trade	1872	.....	.....	.....	.....	.....	.....	.....	.....	...
25	Aleshkof trade classes at the four-class town.	1888	.....	17	.....	.....	.....	.....	.....	.....	...
26	Archangel town trade	1867	.....	.....	.....	.....	.....	.....	.....	.....	...
27	Astrakhan Alexander II trade.	1875	.....	37	.....	.....	.....	.....	18	.....	...
28	Astrakhan benevolent society's trade.	1874	.....	13	.....	.....	.....	.....	10	.....	...
29	Goretzk trade	1872	.....	.....	.....	.....	.....	.....	.....	.....	...
30	Elabujsk trade	1887	8	28	.....	.....	.....	.....	.....	.....	...
31	Lebedinsk trade	1879	.....	10	.....	.....	.....	.....	11	.....	...
32	Yelisavetgrad trade	1867	.....	70	.....	.....	.....	.....	.....	.....	...
33	Abramtzef's primary school joiners' shop.	1877	.....	16	.....	.....	.....	.....	.....	.....	...
34	Kovno Alexander II trade	1889	.....	.....	.....	.....	.....	.....	.....	.....	...
35	Novo Cherkask military trade.	1886	11	.....	.....	.....	9	.....	15	.....	...
36	Lüdinovsk trade.	1875	8	6	.....	.....	.....	.....	.....	.....	...
37	Kozelsk trade	.....	23	12	.....	.....	.....	.....	.....	.....	...
38	Novo-Majatkovsk trade	1883	7	16	.....	.....	.....	.....	.....	.....	...
39	Kiev Alexander trade	1874	53	31	.....	.....	.....	23	52	.....	...
40	Alexander child asylum's trade (Nizhnee Novgorod).	1878	.....	.....	.....	.....	.....	.....	11	11	
41	Vladimeer benevolent society's trade.	1882	19	22	.....	.....	.....	.....	12	.....	
42	Profession section of the Batoom town.	1884	.....	.....	.....	.....	.....	.....	.....	.....	...
43	Minsk primary Jew school, with trade section.	1879	60	14	.....	.....	.....	.....	.....	.....	...
44	Trade section at Vonzsk (government Archangel) village.	1875	.....	7	.....	.....	.....	.....	5	.....	...
45	Class of ivory carving at the Lomonosof village school (government Archangel).	1865	.....	.....	.....	.....	.....	.....	.....	.....	...
46	Vologda trade asylum	1880	.....	10	.....	5	.....	3	.....	.....	...
	Total of third group	.....	357	373	11	38	39	69	288	69	
	Total for all the three groups	.....	2,231	1,414	74	57	148	94	297	69	

a Students of junior classes do not study trades.

'S AND GRADUATES OF THE MIDDLE AND THE LOWER TECHNICAL AND TRADE SCHOOLS—Concluded.

	Graduates.											Cost of support and studies.	Marginal number.
l.	Locksmiths.	Joiners.	Founders.	Engravers.	Blacksmiths.	Turners.	Shoe and harness makers.	Bookbinders.	Tailors.	Bookkeepers.	Total.		
											4	17,696.00	1
		13						4			17	632.63	2
		4									4	927.38	3
		7			7						14	7,189.00	4
												4,424.00	5
	17	12									29		6
		3							3		6	948.40	7
		(b)										1,659.00	8
													9
		14					15	19			48	2,234.12	10
													11
											14	1,382.50	12
		10					10				20	1,106.00	13
	7	2									9	1,659.00	14
												1,106.00	15
											2	1,106.00	16
											8		17
	8	11									19	1,824.90	18
													19
	8	2	9		3	4					26	1,106.00	20
												1,106.00	21
		5									5	442.40	22
													23
													24
												1,106.00	25
												2,571.45	26
												6,359.50	27
												1,935.50	28
												1,935.50	29
												2,422.14	30
		16					17				33	1,993.01	31
													32
		14									14	1,881.86	33
													34
												7,963.20	35
												1,382.50	36
													37
											7	3,124.45	38
	63	39				24	68				194	16,590.00	39
											38		40
	5	5					2		1		13		41
											10		42
	41	3									44	2,765.00	43
		14					15				29	884.80	44
												97.88	45
		11		2							13	1,106.00	46
	833	393	24	2	132	86	171	32	6		1,983	172,923.10	
	1,705	745	33	39	156	90	175	33	6	2	4,421	579,046.30	

b Three or four yearly.

HOURS OF STUDY PER WEEK IN MIDDLE TECHNICAL SCHOOLS.

Subject.	Mechanical course. Classes—				Chemical course. Classes—				Architectural course. Classes—			
	I.	II.	III.	IV.	I.	II.	III.	IV.	I.	II.	III.	IV.
Religion	1	1	1	1	1	1	1	1	1	1	1	1
Mathematics	3	3			3				3	3		
Zoölogy					2	2	2					
Physics	3	3		a 2	3	3			3	3		
Chemistry	3	2			3	3	4		3	2		
Mechanics	5	2			5	2			5	2		
Construction of machines		2	8			2	2			2	2	
Mechanical work		2	3	6				3				
Chemical work				3			6	8			2	
Architecture		3				3				4	7	6
Surveying and levelling	3								3			
Commercial geography and elementary political economy.			2	1		2	1					
Bookkeeping and commercial correspondence.			2	2			2	2			2	2
Laws				2				2				3
Graphical studies.												
Geometrical tracing	6	6			4	4			6	4		
Technical tracing			3	12			4	4			6	
Architectural tracing			6						2	3	10	20
Drawing	3	3			4	2			10	8	6	4
Practical training.												
Mechanical shops	9	9	9	9	9				6	10	6	6
Chemical shops		2				18	10					
Techno-chemical shops							8	20				
Total	36	38	34	38	34	42	40	40	42	42	42	42

a Electrical.

HOURS OF STUDY PER WEEK IN LOWER TECHNICAL SCHOOLS.

Subject.	Classes.			Classes.			Classes.		
	I.	II.	III.	I.	II.	III.	I.	II.	III.
Religion	1	1	1	1	1	1	1	1	1
Arithmetic and algebra (a)	4	3		4			3		
Geometry	4	2		4	2		4	2	
Physics	4	2	1	3	3	6	4		
Chemistry	3	2		3	4	7			
Mechanics		2	4						
Zoölogy				3					
Construction of machines		4	6		2	5			
Mechanical work		2	4		3				
Chemical work					3	8			
Architectural work and materials							6	8	6
Subsidiary adjustments								2	3
Levelling and laying out of materials								1	2
Bookkeeping			2			2			4
Graphical studies.									
Drawing	4	2	2	4	2	2	6	6	6
Technical and geometrical tracing	4	4	6	4	2	4	4	4	4
Calligraphy							2	2	
Practical training.									
Mechanical shops	20	20	20	18					
Chemical shops					10	6			
Techno-chemical shops and training works					10	8	14	14	18
Total	44	44	46	44	42	49	44	40	44

a Algebra is taught only in mechanical classes.

HOURS OF STUDY PER WEEK IN TRADE SCHOOLS.

Subject.	Classes.		
	I.	II.	III.
.....	1	1	2
.....	2	2	2
okkeeping	3	2	2
.....	3	3	.....
edge of physics	.....	2	4
ds in the joiners' section	.....	2	1
als in the locksmiths' section	.....	2	1
.....	2	.....	.....
.....	4	2	2
g	3	2	.....
.....	.....	2	5
n workshops	24	24	24
.....	½	½	½
.....	42½	44½	42½

AMENTAL REGULATIONS FOR INDUSTRIAL(*a*)
S, IMPERIALLY CONFIRMED MARCH 7, 1888.

of these regulations was to afford a definite basis for dis-
led institutions for technical education. So far, however,
ve been established under them. The regulations are as

ustrial schools for the male population of the empire are
r the purpose of propagating in the population middle
hnical and trade education.
dle technical schools teach all that is required for mechan-
t assistants to engineers, and the other chief supervisors

er technical schools, in teaching some special branch,
ledge required by the immediate and direct supervisors
f workmen in industrial works.
de schools teach the practice of different trades, and give
e necessary for an intelligent system of executing work.
f the above forms of industrial schools can exist sepa-
ether with other similar schools of different grades and
lf, in the general superintendency, the middle technical
ined with the lower, or with the trade schools, then such
of schools bears the name of a general industrial school.
rial schools, as far as possible, are joined supplementary
aching workmen during their unoccupied hours.
lustrial schools may be joined with preparatory schools
education. In educational institutions of this kind the
eneral educational subjects may be done in classes desig-
special studies. On the contrary the teaching of some
subjects and practical work may be begun before finishing
educational course in the school, on condition, however,
middle technical schools the teaching of mixed subjects
cal work do not begin until the scholars have ended their
tion according to the third class of real (non-classic) gym-

(French, *industriel;* German, *gewerb*). Included under this term are
nical, lower technical, and trade schools. The higher technical
be taught in the universities.

[An industrial school joined with a school of general education can not be joined with industrial schools of other categories.]

(7) The industrial schools are supported either at the expense of the government, or of communes, or of societies, or of private people. The schools supported by the government treasury or requiring material assistance from it, undergo all the rules promulgated for them by the government, and their teachers and scholars enjoy all the rights mentioned in the regulations. The government can also grant such rights to other schools supported by communes, private people, etc.

(8) The offerings received by these schools, the payment for tuition, and income through the sale of articles made in the school shops are considered to be the sole property of the school. The payments for studies are generally to be employed as supplementary to the sums given to the schools by the government for the salaries of teachers of the corresponding sections, for the purchase of books, and at last for assisting persons in destitute circumstances who have served or who serve in such schools, as well as poor scholars. The profit from the sale of articles is to be chiefly utilized for the needs of the shops.

(9) In industrial schools a predominant significance is given to the teaching of subjects directly relating to the specialty of the school, and also to graphical studies and to practical exercises in the ways of working. The teaching of general educational studies is chiefly limited to a repetition (review) of the programme passed in the preparatory general educational school, with the addition of such subjects only as are needed for the practical life to which the scholars are preparing themselves.

(10) The extent of the course of studies in industrial schools, the determination of the studies entering the programme, and also the time which must be employed for graphical studies and for practical exercises in working are defined by statutes and regulations published for such schools conformably to their specialty and to the local conditions and requirements. On the same basis is also established the extent of studies in industrial schools, it being observed that the programme of middle technical schools and that of trade schools lasts not longer than four years, and the programme of lower technical schools not longer than three years. In an industrial school joined with a general educational one, the general term of the course must not exceed the normal term of studies of both schools. According to this the trade schools completing the general education of primary schools, up to the degree of a two-class village school, can not have a course of studies exceeding five years.

(11) Industrial schools supported by the government are established by order of the minister of public instruction and those supported by other sources are established—the technical, by permission of said minister; and the trade schools, by permission of the curator of the educational district. Technical schools are controlled by the said curators, and the trade ones by the director of public (peasant) schools.

(12) The industrial schools are allowed to accept scholars of all conditions and religions.

[In the schools supported by private people limitations can be allowed in this respect through the permission of the minister of public instruction.]

(13) To enter trade schools one must present a certificate of his ending the course of studies of primary schools; for entering the lower technical school, the course of studies of town or district schools; and for entering middle technical schools, a certificate of his ending the

studies of five classes of real (non-classic) gymnasia, or of any other middle educational institution, the course of which will be regarded equal by the minister of public instruction.

(14) Persons not satisfying the above conditions are allowed to enter such schools if they have stayed at least two years in industrial works, and by their examination can prove that they can follow the course of the school in which they wish to enter. Before accepting such persons the directors must get information of them from the places where they worked.

(15) The full programme regarding the entrance into such schools, as well as the regulations regarding the passing from class to class, and graduating, is published by the ministry of public instruction.

(16) The industrial schools must have—a library, a cabinet of manuals for tracing and drawing (where possible), a special room for modelling, and the necessary books conformable to the specialty of the school. Besides this the schools must have the necessary facilities for practical studies, or the possibility for such guaranteed by private industrial firms.

(17) By permission of the minister boarding schools may be allowed at such industrial schools, provided they be superintended by the managers of the latter schools.

(18) The boarding schools are supported either by the government or by payments received from boarders, or by donations from communes, private people, etc.

(19) The formation of the control and management of boarding schools is appointed by special ministerial instructions.

(20) In industrial schools, supported by the government, the fees for studies are defined—for technical schools, by the ministry; for trade schools, by the curator of the educational district; for those established by private means the fees for studies are determined by those who support the schools.

(21) The composition (personal) and the order of managing industrial schools are defined by statutes published for such purposes, conformable to the necessities and to the statutes existing for general educational institutions of an equal grade.

(22) The teachers of religion are chosen by the school managers after being recommended by the local diocese; their appointment is confirmed by the curator of the educational district.

(23) The teachers of practical work are taken from among those who by their education have the right to occupy the place of teachers in real gymnasia. For trade schools the teachers of general educational studies are taken from among those who have received a technical or artistic education; the teachers of technical studies, technical tracing, and teachers of practical work, from among those who have, at least, graduated from middle technical institutions.

(24) The teachers of religion, of mixed studies, of tracing and drawing, in the laboratory, and the masters having the title of mechanics are considered to be in active government service. The masters not having such titles, and also teachers of modelling, gymnastics, music, and dancing, in schools where these subjects are taught, are simply hired.

[On the recommendation of the superintendent, approved by the curator of the educational district, all the teachers may be private; *i. e.*, hired.]

(25) For increasing general educational knowledge and for the purpose of forming experienced technical school teachers, such schools may have supernumerary teachers.

(26) Teachers of technical schools are appointed for service by the rules existing for non-classic gymnasia, and the trade teachers by those existing for town schools.

(27) The supernumerary teachers and master teachers in technical schools supported by the government are divided into four categories with the following salaries: 960, 1,200, 1,440, and 1,800 rubles ($530.88, $663.60, $796.32, and $995.40) in middle technical schools; 750, 900, 1,250, and 1,500 rubles ($414.75, $497.70, $691.25, and $829.50) in lower technical schools; each of these salaries is given for twelve lessons a week, for fifteen hours in directing the graphical studies, for twenty hours in laboratory work, and for twenty-five hours in practical work in the shops, with a deduction for the hours which were not occupied conformable to the salary.

(28) Those re-entering the service as teachers in technical schools receive at the beginning the lowest salary, and only after five years' service in the same school can it be increased. The next salaries are given to those who have served more time in the school, and have displayed a useful service.

(29) For additional lessons or hours in technical schools the teachers receive an additional pay, which in middle technical schools is calculated at 75 rubles ($41.48) a year for each general educational study, at 60 rubles ($33.18) for each graphical study, etc.

(30) Teachers of trade schools supported by the government receive a remuneration for teaching according to the number of hours occupied by them during the week; the lessons of religion and of special sciences are paid at 50 rubles ($27.65) for a yearly hour, and the general educational lessons at 40 rubles ($22.12), the payment for practical work being 25 rubles ($13.83) for the yearly hour.

(31) In each lower and middle technical school with one or two specialties there is appointed one supervisor, the middle school with three specialties has two supervisors, and the general technical school has four of them who are chosen from among the teachers. Such supervisors must assist the school authorities in controlling the conduct and success of scholars, and must also replace absent teachers.

(32) On combining several middle technical schools, in each of its sections is appointed a special person for controlling and teaching the specialty appertaining to such section.

(33) In industrial schools, in case of need, doctors may be appointed by the curator of the educational district, while in trade schools they may be chosen by the inspector and appointed by the director of public schools.

(34) At industrial schools, conformable to the grade and the number of their teachers, there may be formed pedagogical councils and household committees on regulations, which exist for other schools of the same standing.

(35) At industrial schools there may be appointed positions of honorary curators, and in trade schools honorary inspectors.

(36) These schools have the right to have a seal engraved with the government armories and the name of the school, to procure realties and accept all sorts of gifts, and to get from abroad articles of art, etc., exempted from duties.

(37) Arrests, etc.

(38) Persons teaching in government industrial schools are pensioned according to their grades.

(39) Graduates of middle fourth-class technical schools receive the name of techno-mechanic, conformable to the specialty. Graduates

of such of these schools as have a course of studies of two or three years get the above name only after having served two or three years in industrial works.

(40) Those receiving the name of techno-mechanic, if they have no other higher rights, receive the title of honorable citizen, and also the right to enter higher technical schools of a corresponding nature.

(41) The graduates of middle technical schools, if they did not possess higher rights before entering these schools, have in regard to title and conscription the same rights as those graduating from middle general educational institutions. The graduates of lower technical and also of trade schools receive the rights given to persons of a corresponding education.

CHAPTER IX.

PRESENT STATUS OF INDUSTRIAL EDUCATION IN SCANDINAVIAN COUNTRIES.

CHAPTER IX.

PRESENT STATUS OF INDUSTRIAL EDUCATION IN SCANDINAVIAN COUNTRIES.

Trade schools have not, as yet, attained great importance in Scandinavian countries. Outside the trade departments of some of the technical schools but few exist, and these are still in their infancy. Among artisans there is a strong opposition to the ordinary trade school; but the general opinion among educators and others favors them, and almost every employer finds youths who have graduated from trade schools superior both as artisans and as men. The most important trade schools are those for weaving in Sweden; schools for wood carvers and one for mechanics in Norway; and schools for shoemakers and watchmakers in Denmark. A number of new schools are spoken of, and some are soon to be opened.

Of much greater importance, as yet, than the trade schools in the industrial life of the Scandinavian countries are the technical schools, of which (not including technological institutes) Norway has 14, Sweden 34, and Denmark 82. All of these schools receive support from the governments of their respective countries. They are for the greater part evening schools, and have as their chief object the technical education of artisans, though a few of them offer facilities for general academic studies. A few have trade departments, but most of them are content to give theoretical instruction in the trades, leaving it to the pupils to obtain manual skill in the shops. The greatest attention is paid to drawing of all kinds, especially trade and mechanical drawing. The great majority of the pupils of these technical schools are working already at some trade. Employers are obliged sometimes to send the youths who work for them to these schools; others are glad to pay their fees, and encourage all to attend.

It was observed that nearly every foreman of a shop was a graduate of some technical school. Some idea of the importance given these schools in Scandinavian countries may be gathered from the fact that in Denmark alone, with its 2,500,000 inhabitants, about 10,000 pupils attend technical schools every year.

Next in importance to the technical schools are, in Norway and Denmark, the so-called schools of home industry, their task being the revival of home industry among the country population by teaching

the men to do such carpenter and blacksmith work as may be useful to the farmer, and the women, weaving, spinning, etc., and also different kinds of ornamental work for those who desire it. These schools are regarded as productive of great economic results, in many cases enabling country laborers to double their income during the winter months. In Denmark no less than 500 schools of home industry exist, generally in connection with other schools, and are supported by 400 societies for the promotion of home industry, and in part by the government.

In Sweden few schools of this kind exist, as home industry has always flourished in that country, and skill in all kinds of manual work has been transmitted from generation to generation.

The manual training schools (sloid schools) play a great part in Scandinavian education. In Norway manual training, or sloid, is yet in its beginning, having been introduced principally in higher private schools, but after January 1, 1892, will become obligatory in all public schools throughout the country.

In Sweden the manual training departments are nearly all in public schools of a lower grade. The higher schools teach manual training to a very limited extent. There are also a number of schools in Sweden where manual training only is taught.

In Denmark instruction in home industrial work seems to have taken the place of sloid in most of the public schools; the latter is found only in schools of a higher grade (about 60 in all).

As to the real aim and purpose of instruction in sloid there is even at this date considerable difference of opinion among educators in Scandinavian countries. Although its very practical results are obvious, and manufacturers and other employers are enthusiastic over these schools because they furnish youths who possess more manual skill combined with considerable technical insight than those who have not enjoyed the same advantage, still this is by others regarded simply as an incidental advantage, and not that which gives sloid its real worth.

The prevalent belief that the so-called Nääs system is the one according to which all manual training is conducted in Scandinavian countries is erroneous. Each country has its own system, and nearly every large school some peculiar feature of its own. Thus in Upsal shoemaking is a part of the instruction, in Gothenburg tinsmiths' work, etc.

The higher schools in Norway, where manual training is obligatory and occupies a part of the time which would otherwise be given to the usual studies, have the book work to be accomplished in a year's course fixed by law. Inquiry has shown that in order to introduce manual training the time for the ordinary studies had to be shortened by two or more hours a week in several schools, yet no difficulty had been experienced in doing as much book work as formerly and in doing it as well. This was the case in some schools where inquiry was made.

directors of these schools all agreed that in some cases manual ıing had the effect of making a student more proficient in book :. It is further believed that manual training has a wholesome ence on mental work in general, in this that it stimulates the fac- s besides effecting a more harmonious development. Most schools to have their manual training departments extended. Only in one was manual training spoken of with indifference and looked upon ɔneficial only as taking the place of gymnastics. In no case was it rded as detrimental in any way to proficiency in study.

wing, knitting, mending, and various kinds of needlework have taught in every girls' school in the Scandinavian countries for a t number of years. Embroidery and finer needlework, however, :aught only in private schools. In Sweden an attempt is also being e to introduce cooking courses into the public schools, but so far poor success as the attendance is not obligatory.

the folk schools the pupils receive instruction for four, eight, and ı twelve hours a week for seven years in sewing and industrial ɪ. In the higher private schools the same instruction extends over riod of from ten to fourteen years, and is in most cases obligatory. ıe aim in the public schools is to enable the pupil to make and mend ɔwn clothing, and to teach her various kinds of housework. There ıs to be but one opinion as to the results of this kind of instruc- , viz., all agree that they are excellent, and that especially among ɔoorer classes the ability in different sorts of handiwork and the eco- ical and orderly habits the girls bring with them from school are of t moral and economic importance. Usually the girls on leaving ɔl are competent enough to do sewing of all kinds, plain dress- ing and other similar work, with some skill. The training they ive is thorough and systematic, and many attain a degree of pro- ncy that enables them to earn a living by this kind of work, with- seeking special instruction out of school. Constant improvement nethods is made, and only specially trained and experienced hers are employed.

ɔr the benefit of those who wish further training in the kinds of ɪ above referred to the Scandinavian countries have so-called in- rial schools for women, generally private enterprises, though some hem receive state aid. In addition to teaching sewing, dressmak- etc., these schools have made great efforts to revive the interest in weaving and lace making. Their success has far surpassed expec- ɔn, and it is predicted that owing to their influence home industry flourish in the Scandinavian countries as never before. Some of e schools offer courses in languages, bookkeeping, etc., and do h, it is claimed, to better the economic and social position of ıen.

ıe number of graduates in trade, technical, and industrial schools ıe Scandinavian countries, and the per cent. who go out as graduates

and non-graduates into the occupations for which they have been fitted, are as follows:

GRADUATES OF SCHOOLS IN NORWAY.

School.	Graduates.	Per cent.
Trade schools.		
Skirnfjordm school for mechanics	79	85
Arendal school of carpentry	95	40
Seije school of carpentry	56	40
Dovre school of wood carving	55	90
Kienservik school of wood carving	56	94
Technical schools.		
Trondhjem technical school	60	94
Bergen technical school	23	93
Christiania technical school	22	90
Industrial schools.		
Christiania industrial school for women	250	37
Levanger industrial school for women	100	48
Ofstad industrial school for women	195	50
Frölich industrial school	120	75

GRADUATES OF SCHOOLS IN SWEDEN.

Trade schools.		
Borås school of weaving	87	100
Lenning school of weaving	110	90
Eskilstuna school for metal workers	20	90
Technical schools.		
Örebro technical school (four years, 1888–1891)	78	85
Norrkjöping technical school (four years, 1888–1891)	48	80
Malmö technical school (four years, 1888–1891)	80	95
Borås technical school (four years, 1888–1891)	44	90

GRADUATES OF SCHOOLS IN DENMARK.

Trade schools.		
School for shoemakers (three years)	120	100
School for watchmakers (three years)	50	95
Technical schools.		
Department of painting, Copenhagen technical school	375	95
Department for metal workers, Copenhagen technical school	155	90
Department of painting, Odense technical school	94	95
Department of painting, Aarhuus technical school	110	90

MANUAL TRAINING IN SWEDEN.

In his address before the manual training congress at Munich in 1888 the celebrated Salomon, director of the seminary at Nääs, gave a brief outline of the development of sloid as an educational factor in Swedish schools. He said:

The work of introducing sloid instruction in the Swedish schools, in accordance with present principles, had its beginning in the year 1872; in which year, also, was founded the sloid school at Nääs. In those first years the movement was restricted to the establishment of independent schools and to the introduction of sloid, as a special branch of instruction, into a number of common schools.

the year 1877 the Swedish sloid instruction reached a new of progress, when the diet, at the suggestion of the government, ined to appropriate an annual subvention of 75 crowns ($20.10) the state treasury for the benefit of every common school in sloid instruction for boys should be introduced.

ter giving due credit to Minister F. F. Carlsson for the successful nplishment of this work Director Salomon continued:

was estimated that this allowance of 75 crowns ($20.10) would be to 200 schools; but it is evident that this estimate was much too , since there are now more than 1,000 schools which are entitled to award. With the exception of the common schools in Gothenburg id instruction is everywhere elective.

n Gothenburg sloid is reserved for pupils of the fourth school year the common schools. About 2,000 boys have taken this course. The id teaching is given to 20 different divisions, each of which includes to 19 pupils. There are 13 carpentry divisions, 5 divisions for iron ork, and 1 each for pasteboard work and painting. Each pupil re- ives 7 hours' instruction in sloid per week. This is given by master orkmen. * * *

In 1887 the city appropriated 22,200 crowns ($5,949.60) for this in- ruction, to which the state added the sum of 3,750 crowns ($1,005). As long ago as the year 1875 sloid was introduced as an elective specialty into the common school teachers' seminary at Carlstad, and in the fall of this year (1888) it is proposed to bring it into the common school teachers' seminaries at Lund and at Hernösand.

From the common schools, as a point of departure, the sloid instruction has extended little by little to other educational establishments; and so, within recent years, the opportunity has been given to the pupils of many of the higher institutions of learning (both gymnasia and private schools) to receive sloid instruction at stated hours every week.

Large numbers of teachers' associations have declared themselves in favor of this idea. At the (twelfth) general council of teachers at Gothenburg in 1887 the question for discussion was, "Should sloid instruction be introduced into teachers' seminaries generally; and, if so, in what way and under what form?" On motion of Principal Carlsson, son of the former minister, F. F. Carlsson, the following resolution was adopted:

"In consequence of the experience accumulating on many sides the teachers' council holds it to be indisputable that further experiments should be made in introducing sloid instruction into the general teachers' seminaries. The sloid teaching should form an elective specialty, and, at first, wood sloid only should be taught (cabinetmaking and a little turning)."

It deserves mention, as of special significance, that in recent year sloid has also been introduced not only into the higher schools fo boys, but into a number of girls' schools and mixed schools.

From a hygienic point of view sloid instruction for girls has bee advocated. The so-called people's high schools (the seminaries for t country population) have begun to introduce the sloid; and in t universities at Upsal and Lund sloid rooms are fitted up for the u of students.

The education of the teachers is provided for, partly through cour held in the several provinces, partly through means of the sloid se

nary at Nääs, where every year great numbers of male and female teachers receive free instruction. Those male and female teachers who are installed over the common schools receive a subsidy from the provincial treasuries, and can travel on the state railroads to and from the seminary at reduced fares.

As regards the principles of sloid instruction in the Swedish schools a distinction is commonly made between pedagogic and practical school sloid. This last is now practised in a few schools only—as in the Practical Work School at Stockholm, the Institute of Reformation at Hall, and in certain common schools in the provinces of Stockholm and Carlscrona. The object of sloid teaching here is to enable the children to acquire dexterity and skill in making certain specified objects. This plan, therefore, places the school in servitude to sloid instruction; whereas at Nääs, and elsewhere in Sweden, for the most part, pedagogic sloid instruction provides, first of all, a means of development for the children, and thereby serves primarily for their education. Not skilled labor, but the exercise itself is here the chief object. Since, therefore, sloid instruction is here placed in the service of education, this instruction must be made available for the pedagogic education of the teachers who are in a position to prevent what is designed to be merely a means from being confounded with the end.

Formerly artisans' sloid instruction prospered fairly well in the common schools; but of late years this form of instruction has become less popular, so that in Gothenburg, where this "practical school sloid" has had its strongest fortress, they are earnestly endeavoring, as I have already pointed out, to direct it in a purely pedagogical course.

From all these indications it is apparent, therefore, that sloid instruction in Sweden is having a successful development, both quantitative and qualitative, and corporeal labor will be annually introduced into hundreds of schools. The interest in this instruction reaches to ever-widening circles. For the advantage of a wise and generous education, adapted to the times in which we live, may it continue to extend.

At the close of the year 1890 there were in Sweden 1,392 schools into which manual training had been introduced. These schools received state aid to the amount of 103,067.78 crowns ($27,622.17). Besides, the state appropriates 20,000 crowns ($5,360) annually to support this instruction in various districts. From other sources these schools derive a revenue of 200,000 crowns ($53,600) a year.

To the above number must be added about 200 institutions which, within the year 1891, adopted manual training—state schools, private schools, several sloid schools, and public schools.

MANUAL TRAINING IN DENMARK.

In Denmark there existed for many years prior to 1883 a form of educational hand labor styled "home industry," of which the Danish teacher, Clauson-Kaas, was a prominent advocate and champion.

Owing to differences of opinion between this remarkable man and the secretary of the Central Association of Home Industry (concerning the utility of manual training as a means of intellectual discipline) the partisans of each polemic fell into a violent conflict, and as

a result the movement came to a stand and even showed unmistakable signs of retrogression. At this juncture Prof. Mikkelsen, whose system of teaching is regarded by Herr Schenckendorff with great admiration, and in respect to thoroughness the nearest to perfection of any, exerted his influence as a pacificator.

Prof. Mikkelsen, now director of the sloid school at Copenhagen, as a delegate from Denmark, made an address before the eighth German manual training congress upon the progress of Danish sloid, in the course of which he referred only by indirect allusion to the unprofitable controversies that had been waged between the rival factions. He merely said:

It will be needless for me, in this presence, to go into the early history of the work school movement, as it was conducted in former years by Clauson-Kaas, and so zealously and energetically promoted by him and his friends. This history is so well known in Germany that I can add nothing new concerning it. I remark only that the present aims of our sloid teaching follow other lines than those which the home industry experiment of Clauson-Kaas had in view.

As this address contains a succinct account of sloid instruction as pursued in Denmark its salient points are here reproduced:

In reviewing this new order of things in Denmark I must, in a rude fashion, begin with my own undertaking. Yet this shall not deter me from giving you a wholly objective picture of the development and condition of sloid instruction, as well as of the system pursued by me. I shall endeavor, however, to exclude from my report everything of a polemical nature.

After I had labored for the cause, with voice and pen, for a series of years, in 1883 I established the first genuine sloid school in Denmark at Nestved, where I was then the principal of a technical school. In the year 1885 I went to Copenhagen, founded there, at my own expense, a sloid school, and began to work for the promotion of sloid by means of strenuous agitation, not only in Copenhagen, but everywhere throughout the country.

At the beginning of the school year 1885 Herren Slomann and Winkel-Horn, who had founded a new Latin and real-school, prepared to incorporate sloid as an obligatory study in the plan of instruction in their school. In this school, as everywhere else in Denmark at present (with the exception of two schools), the system of teaching devised by me is adopted. Wherein this system consists I will explain further on.

In the spring of 1886 the Danish Sloid Society was founded at my suggestion, whose aim is to secure the introduction of pedagogical sloid into both the higher and lower schools of the country. The state immediately placed 6,000 crowns ($1,608) at our disposal for the benefit of the society, and at the same time I began to give instruction to teachers.

Soon after this I bought a large, convenient, and well located building, in which I fitted up a sloid school for teachers. Here, in August 1886, was established the first vacation course for teachers, which was attended by 24 male teachers and some female teachers. The attendants on this course were from Copenhagen and other parts of the country.

At the beginning of the school year 1886 sloid was introduced in an experimental way in the Latin school at Fredericksborg. At the same time sloid was taken up in six private Latin and real-schools in Copenhagen, from whence, in the course of the school year, it found admission to three more institutions. The cause of sloid steadily won new friends, and in educational circles people began to make experiments and think earnestly concerning the matter.

In July and August 1887 was held the second teachers' course in my sloid teachers' school, and this was attended by 41 male and female teachers.

The extension of sloid instruction has gone steadily forward until now; and, up to the present time, sloid has been introduced into 11 Latin schools, 13 real-schools, 4 people's high schools, 1 village school, 3 children's homes, and 2 asylums. Many more yet will introduce it during the current year. Finally, there are besides 4 independent sloid schools in Denmark. Some classes also in the common school will be experimentally taught sloid exercises.

At first sloid was taught only to the older boys, afterwards to boys from 10 to 11 years of age. Later it came to be more and more the practice to begin instruction in wood sloid with boys in their seventh year. Originally, participation in sloid instruction was almost everywhere optional; now it is almost everywhere obligatory, and the people are well satisfied to have it so. In the people's high school alone (in consequence of the nature of this school) does it remain elective.

At the teachers' courses (of which four of six weeks' duration will be annually held at my sloid teachers' school) instruction will be given in wood sloid in connection with drawing. Then a series of lectures will be conducted here. These pertain in part to pedagogical and physiological subjects, and, in part, to working tools and the knowledge of materials. This summer two teachers' courses have been held—from the beginning of June to the middle of July and from that time till the end of August.

The state supports this movement for the education of the teachers; and, during the past fiscal year, the state has contributed, through the Danish Sloid Society, 14,400 crowns ($3,859.20) for the furtherance of the cause. The education of the teachers continues through three or four consecutive six weeks' courses, or a single course of six months' duration.

It is gradually becoming clear to us that if sloid is to exert the influence we wish it must rest on the same basis as the other specialties of the school.

The price of tuition is not uniform, but ranges from 2½ to 5 crowns (67 cents to $1.34) per year. Children are allowed to keep as their own the articles they make. The hours of instruction vary from one to four per week.

Teachers and school directors are everywhere well disposed toward the cause. Only exceptionally here and there does one meet an avowed opponent. But all have reached the conviction that we have in sloid a valuable means of education. But the higher and lower schools here are not equally devoted to the cause. While the first are substantially unanimous in favoring the introduction of sloid, there is much hesitation on the part of the lower schools to adopt it. This will disappear with time. Public opinion is unequivocally friendy to sloid.

Artisans hesitated at first, but they already begin to regard the matter with approval. Physicians are its most zealous advocates.

They look upon sloid as a means by which the evil effect of the sedentary habits incidental to the ordinary school may be successfully counteracted. It is hoped, also, that we have therein a means for preventing the development of evil impulses.

In general the communal authorities do not yet understand the great significance of sloid. Only three communes have voted subsidies for the introduction of sloid, and a fourth (Copenhagen) determined, two years ago, that one of the classes might receive sloid instruction in my school for two hours per week, during school hours.

Following out the suggestion and wish of Herr Schenckendorff, who visited me at Copenhagen this year, I proceed now to set forth the distinctive features of my system. I am far from affirming that this system is of unique excellence; but I may say that, in the leading intellectual circles of Denmark, it is acknowledged to be correct in theory as well as in practice.

The word sloid is of ancient northern origin, and in Denmark it has come to signify manual labor in the service of education.

The reasons which led to the formation of the Danish sloid system may be stated as follows:

If manual labor is to subserve the interests of education and of the school by the means of sloid, the system should have reference to the development of the child's mental powers in those directions that are not provided for by the system of theoretical instruction. It is believed that through practical labor the special capacities of the child, especially the faculties of observation and taste, may be unfolded in a wholly different manner from that which is possible by theoretical instruction alone.

The many different objects which the child takes in hand and brings before the eye—which it must work with, and which it must make according to specified models and drawings—lead very systematically to the education of the faculties of observation and comparison, and compel the thoughtful attention of the pupil. The child is restricted to the making of a particular object, or of its single parts when it would not otherwise be able to construct anything worth mentioning; accordingly, it learns thereby to concentrate its thoughts upon one specific object of some kind.

As a result of the work the finished object, with its faults and imperfections, leads the child to the correction of his exercises, and so teaches him the elements of criticism of manual labor. Whoever has concerned himself much with sloid must have noticed what patient trials are requisite (so foreign to a child's nature) to overcome all the difficulties that pertain to the handling of materials and the different working tools.

The speaker, in summing up the advantages of sloid as an educational agency, declared his convictions as follows:

Therefore, since it exercises the faculty of observation, promotes clearness of conception, sharpens the perception of cause and effect, develops the sense of form and of beauty, concentrates the attention, cultivates patience, and, withal, creates a love and enthusiasm for labor, it is, in reality, the entire intellectual strength of the child which is called into requisition by sloid.

In Denmark this pedagogical object of sloid occupies an advanced position; and from this point our system must carry it forward.

To condense the further claims of sloid instruction, as stated by Prof. Mikkelsen, it is admirably adapted, in the opinion of physicians, to improve the circulation and the breathing; and, from a physiological point of view, it is therefore excellent. Besides, as the speaker said, "School children often show a tendency to become round shouldered. This tendency will be counteracted by sloid work, which requires the pupil to labor with his arms wide apart." The work is useful, also, as a corrective of bad habits in sitting or standing It tends to give symmetry of development. Children are required to bend the body at the hips, and are not permitted to crook their backs at work. They are also trained to use the left hand in some of the exercises; and, it is said, that as a corrective of short-sightedness the objects on which the pupils busy themselves are gradually removed to a greater distance from the eye.

From the point of view of social economy, too, this speaker urged the adoption of sloid teaching. "Much of the poverty and want of the lower classes of society would disappear," he declared, "if the youth should learn to love and honor corporeal labor, instead of hating and shunning it, as now."

He thinks that "many misunderstandings and disagreements between the higher and the lower classes of the people would cease if the former were to learn to appreciate the worth of bodily labor."

Then, again, "today very many boys, through unfortunate circumstances and through ignorance of themselves, enter into a calling for which they possess neither fitness nor inclination; as a consequence they have a feeling of discontent, as if they were not in the right place, and they are apt to become useless or criminal. Many such unfortunates might be saved to society through sloid instruction as a preparation for life."

Again Prof. Mikkelsen continues:

We are unequivocally opposed to the so-called polysloid because we are convinced that, with many different kinds of labor to be done, it is never possible to execute a single kind so thoroughly as the interests of education require.

We have, therefore, chosen wood sloid alone (work at the carpenter's bench) as a means of instruction, because it appears to us, for the present at least, to be the only sloid method by which we can most certainly obtain the best pedagogical, physiological, technical, practical, social, and economical results.

Instruction in wood sloid begins with special single forms, and extends in an uninterrupted series of exercises, arranged according to established pedagogical and physiological principles, with reference to technical and practical requirements.

In this way the child will gain distinct ideas which may be joined together to form a whole. This clearness of conception will be best attained when the child perfectly masters the various working tools, each of which represents a particular kind of idea. Accordingly, each exercise leads up independently to one result (object), which exhibits

in its finished state the work of the principal tool. But, at the same time, it represents a sum of related ideas.

In concluding this part of his subject Prof. Mikkelsen insisted that, in order to insure good results from class instruction in sloid, it is necessary not only that the shop, the tools, etc., should be adapted to the end in view, but that, "before all things, the teacher should possess sufficient skill and interest in his specialty."

The recommendation is made that drawing should be taught in the people's schools in connection with sloid, and that sloid models should be made use of for copying exercises in drawing. In some schools this plan has been carried out with good results the speaker said, as at Stockholm, where, in 1887, he was greatly surprised to witness the remarkable effects of this method of teaching drawing in the school of Mr. J. J. Dahlström.

"Next," the speaker said, "after this general survey of the system, it is in order now to show in detail where every exercise has its place, and therefore in what sequence the working tools should be taken up."

We quote only what Prof. Mikkelsen had to say concerning one of the sloid tools, viz., the saw:

Give a child the opportunity to busy himself with saw, plane, knife, etc., and he will always return to the first named implement. The reason for this is, on the one hand, that the saw requires a lively movement, and, on the other, it is possible for the child to cut wood with a saw just as he likes. It also affords the child special delight to handle a tool which he commonly sees only in the hand of the adult.

But we may cite other reasons for choosing the saw as the first working implement. The discipline demanded by the saw presents but slight difficulty. Then one may (more than in any other exercise) assume a healthy and graceful posture. So it comes about that the saw is popular. It is, besides, the "most independent" of all tools; because with it one may make a complete and useful object without the aid of other tools, except, perhaps, a nail to hold the parts together. It also makes it easy for the child to understand a straight line.

Our saws are somewhat smaller than those used by workmen, and are so constructed as to require only the smallest possible outlay of strength. We distinguish the saws as the rip-saw, the cross-cut saw, and the back-saw. These three kinds should be employed consecutively in the order named, since each presents its own peculiar difficulties. The rip-saw cuts in the direction of the grain, and the position of the body in using it offers no difficulty. With a little practice this saw can be used with either hand, changing from one to the other. The cross-cut saw is somewhat harder to manage, because the saw teeth easily penetrate the soft interstices of the grain. But if the children have already learned by handling the rip-saw to hold the saw lightly and steadily the difficulties will be readily overcome. The back-saw requires greater precision, and must, on this account, be taken up in the third place. It would not be easy, with this implement, to preserve a good position of the body without previous practice with the rip-saw and the cross-cut saw.

This course is connected with construction—first, parallel, then rectangular, and, finally, diagonal lines.

At this stage the accessory tools are the metre measure, the lead pencil, the square, and the hammer.

In the same exhaustive manner Prof. Mikkelsen described the place and uses in his system of the plane, the knife, the bit and bit stock, the file, etc.

In conclusion he remarked, "Such are the requirements which the friends of sloid lay upon the sloid teachers. If these are not carried out the whole movement must soon come to naught. The time of fine theories has gone by; we now demand a sound practice which shall secure what theory denied to us."

CHAPTER X.

PRESENT STATUS OF INDUSTRIAL EDUCATION IN SWITZERLAND.

CHAPTER X.

PRESENT STATUS OF INDUSTRIAL EDUCATION IN SWITZERLAND.

NATIONAL SUBSIDIES.

The constitution of the Swiss confederation permits the federal congress to establish and to support, in addition to a university and a polytechnic school, other higher technical institutions. It leaves to the cantons the primary education of the children, giving them the exclusive direction of the primary schools. It directs, however, that such education must be obligatory, and, in the public schools, gratuitous, and that all pupils must be permitted to attend the public schools without prejudice to their liberty of belief and conscience. The constitution also authorizes the confederation to make uniform regulations regarding the employment of children in factories.

On June 27, 1884, a resolution was adopted by the federal congress granting subsidies, under certain conditions, to all institutions for professional and industrial education that desired to accept such aid. It resulted in the establishment of new, and the development of existing, institutions, and has given a great impetus to industrial education throughout the country. Since the adoption of the resolution the number of trade schools has been nearly doubled, and other industrial institutions, such as drawing schools, workingmen's evening schools, industrial art schools, etc., have greatly increased in number and efficiency. The following is a translation of the text of the resolution and of the regulations for enforcing the same:

ARTICLE 1. For the purpose of advancing professional and industrial education the confederation will grant subsidies out of its treasury to any institutions that are or will be established for such objects. When any of these institutions have other objects aside from professional and industrial education, as, for instance, general education, the federal contribution will be made only for the former branch.

ART. 2. The following are regarded as institutions for industrial and professional education:

The workingmen's schools, the schools for professional improvement, and industrial drawing schools, even if these are in connection with the public schools, the higher industrial and professional schools, the art schools, the trade schools, collections of patterns, models, and other materials for technical instruction, and professional and industrial museums.

ART. 3. The confederation can also contribute toward paying for lectures and prizes in connection with professional and industrial education.

ART. 4. The federal subsidies may, according to the judgment of the federal council, amount to one-half of the sum provided by the cantons, communities, corporations, and private individuals.

ART. 5. The federal council (*Bundesrath*) will call upon the cantonal governments for detailed information regarding the uses made of the sums mentioned in article 4; it will take cognizance of the progress of the institutions, and will require the receipt of programmes of instruction, reports, and results of examinations. In determining the federal subsidy special consideration must be made for institutions which educate teachers for professional and industrial instruction, and particularly institutions where drawing teachers for the workingmen's schools and the schools for professional improvement are educated.

The confederation shares, in the same measure, the expenses for educating candidates for teachers at the institutions named in article 2.

ART. 6. The federal council will negotiate with the cantons regarding the conditions on which the confederation will participate in the professional and industrial education, and it will make the final arrangements with them, by contract, if necessary.

ART. 7. The contributions of the confederation must not result in a diminution of the amounts contributed by the cantons, communities, corporations, or private individuals; they should result, on the contrary, in stimulating an increase of energy in the domain of professional and industrial education.

ART. 8. The confederation will set aside in its budget a credit of 150,000 francs ($28,950) for aiding professional and industrial education. This credit may be increased when the need becomes apparent, and when the financial condition of the confederation permits it.

For the year 1884 a supplementary credit of 100,000 francs ($19,300) will be placed at the disposal of the federal council for this purpose.

ART. 9. The federal council is instructed to publish this resolution, and to fix the time when the same will go into effect, in conformity to the federal law of June 17, 1874, concerning popular voting on federal laws and resolutions.

The following are the regulations, adopted January 27, 1885, concerning the execution of the resolution relating to industrial and professional education:

The federal council of Switzerland, in executing the federal resolution of June 27, 1884, relating to professional and industrial education, resolves, at the suggestion of the Swiss department of commerce and agriculture, as follows:

ARTICLE 1. Requests for subsidies from the federal government for professional and industrial education must be made to the Swiss department of commerce and agriculture, and must be forwarded by the cantonal governments after the latter have examined the applications and found them worthy of consideration.

ART. 2. The first application made by any institution must contain:

A. In reference to organization:

(1) The full name and location of the institution.

(2) The name of the proprietor.

(3) Duration of its existence—date when founded.

(4) A full description of the institution—statement relating to organization, arrangement of classes, object, management, attendance, and conditions of admission of pupils.

(5) All publications up to date of documents giving any informa-

ion regarding the institution, such as laws, decrees, ordinances, regu-
ations, programmes, statutes, annual reports, accounts, catalogues, etc.
3. In reference to finances:

(1) A detailed account of income and expenditures during the last fiscal year.
(2) A detailed account of expense budget for the fiscal year for which the subsidy is desired. These documents must contain accurate information of the contributions and other support from the cantons, communities, societies and corporations, and private sources, and the special uses made of these contributions.
(3) Statement relating to the dues, tuitions, admission fees, etc., required of persons attending the institution.
(4) The proposed uses to be made of the federal subsidy; a detailed account relating to the same. Expenditures which are contemplated for the first time during the coming fiscal year must be distinctly specified.
(5) Amount and value of property possessed by the institution.

ART. 3. For schools and special classes the following will be re-
uired in addition:

(1) Statement of the divisions of the scholastic year, the classes, courses, etc., and the duration of each.
(2) Statement of the number of weeks of instruction per year, and the distribution of the same in months.
(3) The programme of instruction — faculty, courses of study, weekly hours of session, arrangement of hours, etc.
(4) Statement of number, sex, and required age of pupils.
(5) Statement of the attendance of each branch of instruction, and whether the same is obligatory or optional.
(6) Information as to whether the institution trains teachers for technical schools and how, especially drawing teachers for the workingmen's schools and the schools for professional improvement.

ART. 4. Applications for federal subsidies for collections named in
rticle 2 of the federal resolution must be accompanied by the statutes,
egulations, and reports relating to the object of the collection, the
ight of access to the same, the patronage up to date, etc.

The statutes must designate clearly the disposition made of the ar-
icles provided by means of the federal subsidies, so as to make it pos-
ible to identify the same in case of a discontinuance of the institu-
ion.

ART. 5. Applications for federal subsidies for lectures and prizes re-
ating to professional and industrial education, and for distributing
tipends to candidates for teachers of the institutions named in article 2
f the federal resolution, must be treated in the manner specified in
rticle 1 above.

Stipends to candidates for teachers will be granted only on condition
hat the cantonal government grants like stipends. The federal sti-
end, in any case, can not exceed that of the canton. The recipient of
federal stipend obligates himself to report at least once every six
nonths to the department of commerce and agriculture regarding his
rogress and studies, and to connect himself at the end of his studies
vith one of the institutions mentioned in article 2 of the federal reso-
ution.

ART. 6. Applications of existing institutions which already receive federal subsidies must contain:

(1) A complete report of the progress, resources, and attendance during the past fiscal year, and, in addition to the provisions of article 3 of these regulations, a brief characterization of the results of examinations must be added.

(2) A complete programme for the coming scholastic year.

(3) The statements required in article 2, section B, of these regulations, and also a detailed account of the dispositions made of the federal subsidies.

(4) Printed annual reports, accounts, etc.

ART. 7. Estimates for subsidies requested must not as a rule include:

(1) Expenditures for general administration, office expenses, rent, maintaining rooms or buildings, lighting, and fuel.

(2) Expenses for school furnishings, furniture, cases, etc., for collections, and supplies (paper, etc.) for the use of pupils.

The following may be included and subsidized:

(1) Expenditures for raw materials, tools, apparatus for instruction (in workshops, etc.), and collections.

(2) Expenditures for certain *Installationen* for the special use of the named institutions.

The Swiss department of commerce and agriculture will examine each application and decide according to its merits.

ART. 8. Institutions receiving federal subsidies must furnish any further information to the department of commerce and agriculture that the latter may require.

ART. 9. The Swiss department of commerce and agriculture is empowered, subject to the approval of the federal council, to act upon the applications mentioned in article 1, remaining within the limits of the budget, and it will decide as to the amount of the subsidy to be given in each case.

ART. 10. The subsidies may, according to circumstances, amount to one-half of the total sums contributed annually by the cantons, communities, corporations, and private sources. The subsidies hitherto granted by the cantons and communities must not be diminished. In reference to the contributions of corporations and private sources the department of commerce and agriculture may, if it deems necessary, require a guaranty for a specified time.

ART. 11. An inventory of property purchased with the federal subsidies must be made each year and forwarded to the department of commerce and agriculture for examination and approval. The same must be made through the cantonal government, which will guarantee that the property will be used for public purposes should the institution to which the same belongs be discontinued. The cantonal governments will be held responsible for the correctness of the inventories.

ART. 12. The subsidized collections must be made accessible as much as possible, by loaning the articles to temporary exhibitions and private individuals, always on security, and by permitting the multiplication of the same by means of photography, copying, etc.

ART. 13. A federal subsidy may be granted for an entire course, extending over several years, with the reservation that the subsidy may be withdrawn in case the institution or course is discontinued before the end of the time, or when the course may not prove satisfactory.

ART. 14. The department of commerce and agriculture has the privilege of making at any time an inspection of the work of any institu-

tion subsidized by the confederation, either directly or by sending a delegate, and it may also be represented at the examinations.

For this purpose timely notice must be given of all examinations to be held.

The department of commerce and agriculture will prepare the instructions for its inspectors, in which their duties and compensations will be specified.

ART. 15. The present regulations take effect at once.

The results of the resolution are shown by the following statistics:

EXPENSES FOR INDUSTRIAL EDUCATION, 1885 TO 1889.

Year.	Institutions subsidized.	Total expenses.	Paid by cantons, communities, private individuals, etc.	Federal subsidies.	Total amount spent by federal government by virtue of the resolution.
1885	82	$156,732.15	$99,336.95	$29,324.46	$33,075.70
1886	100	185,176.49	116,220.96	38,672.43	42,462.44
1887	110	197,652.71	122,854.98	42,275.62	50,176.52
1888	120	231,914.52	139,749.89	54,861.75	61,572.16
1889	124	253,498.37	147,600.32	62,023.25	70,845.32
Total		1,024,974.24	625,763.10	227,157.51	258,132.14

Institutions entitled to federal subsidies are divided into three classes by the department of commerce and agriculture: Trade schools (including schools for watchmaking and weaving, workshops for apprentices, pattern and model collections, etc.); industrial art institutions (schools and collections); workingmen's schools, drawing schools, and schools for professional improvement.

The department of commerce and agriculture appoints for each class from four to six inspectors (or experts) who represent the department at examinations, investigations, etc. At least once each year these inspectors have a conference for the discussion of special questions relating to their work (methods and plans of instruction, programmes, etc.), and for stimulating the advancement of the institutions placed under their supervision.

Following are the amounts of the federal subsidies paid during the year 1890 to the various kinds of industrial institutions:

DISTRIBUTION OF SUBSIDIES.

Kind of school.	Schools.	Subsidies.
The Technikum, Winterthur	1	$6,915.58
General Industrial School, Basel	1	8,088.00
Schools for industrial arts and drawing	7	14,724.36
Industrial drawing schools	31	2,703.16
Schools for professional improvement and workingmen's schools	57	8,963.93
Weaving schools	2	1,930.00
Watchmaking schools	7	9,705.00
Workshops for apprentices	8	6,154.77
Wood carving schools	2	752.70
Female industrial schools	5	2,151.95
Industrial museums, collections, etc	13	8,828.21
Total	134	65,917.66

CLASSIFICATION OF SCHOOLS.

Institutions for industrial education, including those where manual work is taught, in Switzerland may be divided into the following classes:

Kindergartens.

Classes in manual training, comprehending needlework for girls, and pasteboard and wood work for boys (sloid system); trade schools for male apprentices, which include watchmaking schools, carpenter workshops, shoemaking workshops, schools for metal workers, schools for wood carving, and schools for weaving; industrial schools for women, which include schools for needlework and ladies' tailoring, housekeeping schools, and schools for servants; industrial art schools (either sex), which are schools having classes in pattern designing for the textiles, modelling, ceramics, engraving, sculpture, etc.

Institutions for the further development of working people of both sexes, under which name are included schools for professional improvement, workingmen's schools, and industrial drawing schools.

Higher technical schools—Cantonal Technical School at Winterthur, canton Zurich, comprising schools for builders, mechanical and electrical engineers, and surveyors of industrial arts and of commerce; Federal Polytechnic School at Zurich, comprising schools for architects and builders, civil engineers, foresters, chemists, engineers of construction and of agriculture, a mechanical technical school, a school for special teachers of mathematics and natural philosophy, and in addition special courses of lectures on art, history, political science, military science, literature, languages, mathematics, natural sciences, and technical branches.

Industrial and art museums.

KINDERGARTENS.

Kindergartens in Switzerland exist mostly as private institutions, supported by tuitions, societies, donated funds, and contributions from the states or communities. In canton Geneva, where kindergartens are state institutions, no tuitions are required, and the instruction forms part of the educational system of the public schools. There is a gradual advance from kindergarten work to manual training. In other cantons the kindergartens are generally independent of each other and of the public schools, and differ greatly in their systems of instruction and in the manner of their support. In nearly all the Swiss kindergartens the Froebel materials are used together with other subjects, such as elementary studies, object lessons, games, etc. The age for admission varies greatly in the different kindergartens, ranging generally from 2, 3, and 4 to 5, 6, and 7 years, the average being about from 3 to 6 years. The *latest* statistics collected regarding kindergartens in Switzerland are

ar 1889 by M. Grob, secretary of public instruction at Zurich. as follows:

PUPILS AND TEACHERS IN KINDERGARTENS.

Canton.	Schools.	Boys.	Girls.	Total pupils.	Teachers.
.....	61	1,657	1,875	3,532	79
.....	62	.....	.....	2,550	62
.....	3	.....	.....	260	6
.....	1	.....	.....	.....	.....
.....	4	.....	.....	91	4
.....	2	.....	.....	85	2
.....	5	97	91	188	6
.....	10	.....	.....	912	10
.....	8	.....	.....	.....	.....
.....	32	1,084	1,033	2,117	46
.....	8	.....	.....	452	8
ater Rhodes	16	369	474	843	19
ner Rhodes	1	.....	.....	60	2
.....	2	42	38	80	4
.....	13	.....	.....	.....	13
.....	23	658	693	1,351	43
.....	160	.....	.....	4,000	160
.....	3	.....	.....	249	3
.....	36	.....	.....	997	36
.....	65	1,993	1,879	3,872	85
.....	515	.....	.....	21,639	589

MANUAL TRAINING.

l training schools like those of the better class in the high ade in the United States do not exist in Switzerland. What manual training for boys is more like advanced kindergarten n training which tends to make pupils more proficient in the It consists of the execution of cardboard and simple wood newhat on the plan of the sloid system. Sheets of cardboard red and cut into the necessary forms, and then by means of l colored paper they are transformed into little useful articles, ing with simple cubes, plain boxes, lids, etc., and advancing to more complicated pieces, such as paper shelves, match cture frames, card baskets, pen boxes, etc. The wood work of simple work with the knife, the chisel, the saw, the plane, hammer. They begin generally with simple work with the ch as making penholders, salad spoons, etc., later, rules, boxes, dovetailing work, receivers for inkstands, etc. No eems to be made to prepare the pupils for any profession, the g simply to give the boys an idea of and a taste for such work e useful for them to understand in their own homes, and in make them more proficient in the use of their hands. Manual is also looked upon as a profitable and pleasant recreation ans of keeping the boys from the streets. The classes in man- ng are generally held after school hours and are outside and ent of the school programmes.

l training classes for boys exist at the present time in the can- sons, Saint Gall, Appenzell, Thurgau, Schaffhausen, Zurich,

Aargau, Basel, Soleure, Bern, Neuchâtel, Freyburg, Vaud, Glarus, and Geneva, over one-half of the cantons. In the cantons Vaud and Neuchâtel the state contributes 200 francs ($38.60) per year and furnishes the materials whenever a school or class for manual training is organized. In Bern the state pays 100 francs ($19.30) per year toward the expense of each class. In Geneva all expenses are paid out of the public funds, and manual training is compulsory for all male pupils at all public schools. The latest statistics collected on the subject of manual training are the following for 1889:

STATISTICS OF MANUAL TRAINING CLASSES.

Canton.	Classes.	Pupils.	Teachers.	Hours per week.
Zurich	19	305	13	3
Basel	32	558	19	.....
Saint Gall	6	122	8	.....
Schaffhausen	2	120	2	.....
Grisons	2	48	2	2½
Thurgau	2	46	1	.....
Soleure	.....	40	1	.....
Aargau	1	.....	1	.....
Bern	5	175	5	4

Vaud, Neuchâtel, Appenzell, Freyburg, and Glarus each have several classes, but the statistics are not available.

Boys attending manual training classes are generally from 9 to 13 years of age.

Manual training for boys in Switzerland is yet in its infancy, having been introduced but a few years ago. It has not existed long enough, nor has it developed sufficiently, to have shown any appreciable effect upon the proficiency of pupils as workingmen. This opinion is expressed by the leading teachers of manual training, as well as by those who employ skilled labor. The teachers of manual training are everywhere working zealously for the development of the work. Every year, during vacation time, a class for manual training teachers is held at one of the cities of Switzerland, and these classes are well attended. The first class of this kind at Basel in 1884 was attended by 40 persons, while at the last meeting at Chaux-de-Fonds in 1891 there were over 100 participants, including several foreigners. The meetings or classes are under the direction of M. Rudin, the gentleman who introduced the system of manual training into Switzerland.

Manual training for girls, such as needlework, knitting, darning, mending, etc., has existed in Switzerland for many years, and in most cantons it is considered as one of the most important branches of study for girls. In nearly all cantons this instruction is compulsory.

The following table gives a fair idea of the nature and extent of this work in Switzerland:

MANUAL TRAINING FOR GIRLS.

ıton.	Age for commencing.	Age for finishing.	Years of work.	Hours per week.	Obligatory?	Nature of work done.
.....	10	13	3	3 to 6	Yes...	Knitting, sewing, mending, and cutting.
.....	6	9	3	3 to 6	Yes...	Knitting, sewing, mending, cutting, and finishing garments.
.....	9	13	4	3	Yes...	Knitting, sewing, mending, cutting, and finishing garments.
.....	.....	.....	.....	.....	No....	Plain needlework.
.....	8	13	5	4	Yes...	All kinds of plain needlework, and household duties.
en (Upper)	9	.....	.....	4	Yes...	Plain needlework.
en (Lower)	10	14	4	2 to 4	Yes...	All kinds of plain needlework.
.....	10	16	6	3 to 6	Yes...	Knitting, mending, cutting, and sewing.
.....	6	12	6	2½ to 6	Yes...	Plain needlework.
.....	.....	.....	.....	3 to 4½	Yes...	Knitting, sewing, mending, cutting, and preparing garments.
.....	9	16	7	4 to 6	Yes...	Knitting, sewing, mending, drawing, cutting, and housekeeping duties.
n.....	6	14	8	4 to 6	Yes...	Knitting, sewing, mending, cutting, and finishing.
l.....	9	14	5	4 to 6	Yes...	Knitting, sewing, mending, cutting, and finishing.
en.....	9	15	6	4 to 8	Yes...	Knitting, sewing, mending, and cutting.
Outer	10	16	6	3	Yes...	Knitting, sewing, mending, cutting, crocheting, and lectures on housekeeping.
Inner	.....	.....	.....	3	No....	Knitting, sewing, mending, cutting, and lectures on housekeeping and gardening.
.....	10	14	4	3	Yes...	Knitting, sewing, mending, technical drawing, and lectures on housekeeping.
.....	10	16	6	3	No....	Knitting, sewing, mending, drawing, and cutting.
.....	10	16	6	3 to 6	Yes...	Knitting, sewing, mending, finishing garments, and lectures on housekeeping.
.....	10	16	6	6	Yes...	Knitting, sewing, mending, cutting, technical drawing, and lectures on housekeeping.
.....	6	15	9	4	Yes...	Plain needlework, and lectures on housekeeping.
.....	7	16	9	3 to 6	Yes...	Plain needlework, and lectures on housekeeping.
.....	7	16	9	.....	No....	Plain sewing, etc.
.....	7	16	9	2 to 4	Yes...	Plain needlework, and lectures on housekeeping.
.....	6	12	6	6	Yes...	Plain needlework, and lectures on housekeeping.

ıton Zurich manual training for girls at the age of 9, and from ı years, is optional; in Basel Land it is optional from 14 to 16 f age; and in canton Lucerne it is optional during the thirteenth rteenth years.

naximum number of pupils in a class in any canton is 30. The ls for work are generally furnished by the school authorities or nities. Where this is not done the pupils contribute the money purchases. Instruction everywhere is gratuitous.

DERGARTENS AND MANUAL TRAINING, GENEVA.

eneva is the only canton in which the kindergartens and instruc- manual training for both sexes are considered as parts of the system of public instruction, the following translation of parts ›fficial programme is given to show the connection between them:

PROGRAMME OF KINDERGARTENS.

Inferior division (ages 3 to 5 years).—Intuitive instruction by means of the Froebel materials. Ethical talks: simple conversations with the children, with a view to developing them morally and intellectually, and correcting bad habits. Object lessons: conversations for the purpose of acquainting the children with the names of objects, plants, and animals familiar to them. The first year the object lessons are given in conjunction with the ethical talks. Native language: exercises in language, in which children are taught the meaning of the terms "words" and "phrases," to find them and to use them. These exercises always follow the object lessons. Penmanship: preparatory exercises in making letters. Arithmetic: counting by means of the Froebel materials; calculating up to 6; dividing the whole into halves and quarters. Geometry: elementary geometrical ideas by means of the Froebel materials. Drawing: first year, children are prepared for drawing by means of the Froebel materials; second year, first attempts in drawing—cubes, little surface figures, etc., are arranged by dots on the slate, which the children complete by connecting the dots with lines. Singing: simple melodies with easy words. Intuitive instruction in measure. Gymnastics: movements and games; marches, rounds, and ball playing.

Superior division (ages 5 to 7 years).—Intuitive instruction by means of the Froebel materials. Ethical talks: conversations, of which the essential object will be to develop in the children sentiments of affection, conscience, a love of work and of duty. Object lessons: narratives, conversations, and explanations, giving the pupils ideas of the scientific elements of objects, plants, or animals of the country. The teachers will aim to develop in the children a spirit of observation, reflection, and judgment. Native language: lessons preparatory to reading; exercises of analysis, by which pupils are taught to recognize and find the words, syllables, and sounds. Study of vowel and consonant sounds. Reading simple syllables, words, and short easy phrases. Reproduction, orally and in writing, of words and phrases. Little oral exercises of composition. Penmanship: elementary exercises with the pencil, advancing gradually from letters to syllables and short words, to be written from dictation. Preparatory exercises with pen and ink. Arithmetic: exercises of calculation by means of the Froebel materials. The four fundamental rules of arithmetic up to 10; calculations, oral and written; division of the whole into halves, fourths, and eighths; little oral problems; writing numbers up to 20. Geometry: notions of geometry by means of the Froebel materials; points, lines, surfaces, solids. Drawing: third year, continuation of the previous exercises by means of dotted cubes, squares, etc., ornamental designs obtained by combining straight lines (made by means of rules or by tracing), designs containing curved lines, composition, drawing from memory; fourth year, dividing lines into 2, 4, 8, 3, and 6 equal parts, application of these divisions to ornamental designs, combining straight and curved lines, geometrical figures, triangles, squares, rectangles, drawing common objects, drawing letters and printed characters, first attempts at drawing foliage. Singing: exercises of intonation; the scale of C; harmony; songs of one and two parts; melodies and easy songs. Gymnastics: movements and games; marches, rounds, and ball playing. Needlework: preparatory exercises in sewing.

In the primary schools which follow these the same studies are continued and others gradually added, as will be seen in the following table of subjects and the distribution of the hours of instruction per week:

COURSE OF STUDY IN THE PRIMARY SCHOOLS.

ect.	Hours per week.					
	First year.	Second year.	Third year.	Fourth year.	Fifth year.	Sixth year.
ge, French:						
ons	9	9	9	8	2	2
d recitation					2	2
m, orthogra- grammar					4	4
	2½	3	3	3	3	3
			2	2	2	2
				1½	3	3
		1½	2	2	2	2
				1½	1½	1½
	3	3	4	3	3	3
	1½	1½	1½	1	1	1
	6	4	3	3	1½	1½
	2	2	1½	1	1	1
ng	6	6	4	4	4	4
	30	30	30	30	30	30

nual training work in the primary schools is as follows:

ar (ages 7 to 8 years).—Girls: Sewing, preparatory exercises, ut of the needle and thimble; practice on coarse goods in the inds of stitches—the running stitch, side-stitch, seam-stitch, h, backstitch, cross-stitch; seams and hems, making a small ı a hem, drawing through on canvas. Boys: Exercises in olding, and interweaving; cutting up pieces of colored paper ng them into geometrical designs.

ear (ages 8 to 9 years).—Girls: Knitting, executing a strip of hes, right and left meshes; sewing, repetition of first year's ing bias, sewing with the running stitch, stitching on canvas, ı infant's chemise. Boys: Cutting paper and cardboard in f geometrical solids; combination work by means of colored ı canvas or paper.

ear (ages 9 to 10 years).—Girls: Knitting an average size· epairing stockings, right meshes, darning; sewing, repetition s year's work, work by means of the backstitch, stitching on ing a chemise for a child of 2 or 3 years of age. Boys: Con- cardboard objects lined or covered with colored paper; wire lises, geometrical solids.

ear (ages 10 to 11 years).—Girls: Knitting stockings, repeti- vious year's work, continuation of repairs on stockings; back- k on the bias, hemming linen pieces, making a child's apron, hape, for a child of 3 years. Boys: Construction of simple cardboard; wire work.

ır (ages 11 to 12 years).—Girls: Knitting, executing different ontinuation of stocking mending, darning holes, etc.; sewing, of previous work, buttonholes, gathering, folding regular means of a pin or needle, darning cloth, making pillow slips ons and buttonholes, elementary exercises in cutting. Boys: objects and making them from the sketches; notions of the

most useful tools, study of the principal tools used in wood work, planing and sawing wood, simple joining, nailed boxes and other joined work, objects made of wood and cardboard, constructing objects from side sketches.

Sixth year (ages 12 to 13 years).—Girls: Knitting, theory of stocking knitting; crocheting, theory and study of the various meshes; sewing, repetition of previous work, hemming, wristbands and cuffs, open worked hems, ornamental stitches, chain-stitches, etc.; application of the various stitches in embroidery; making an apron with a waistband, wristbands, and adorned by means of the different fancy stitches; small plaits, repairing and mending useful objects; exersises in cutting and finishing. Boys: Further development of fifth year's work.

After finishing their studies at the primary schools boys who desire to follow an artistic, industrial, or a commercial profession, or to enter an industrial school later on, attend the two years' course at the manual training school. The work in this school closely resembles that in American schools. Here the manual training is continued from the primary schools, together with some of the other studies, as shown in the following table of subjects and the distribution of the hours of instruction per week:

COURSE OF STUDY IN THE MANUAL TRAINING SCHOOL.

Subject.	Hours per week.		Subject.	Hours per week.	
	First year.	Second year.		First year.	Second year.
French	4	3	Chemistry	.....	2
German	4	4	Bookkeeping	2	2
Commercial geography, history, and civic instruction.	4	4	Drawing and modelling	7	7
Arithmetic and algebra	2	a 2	Technical drawing	2	2
Geometry	2	a 3	Manual training	3	3
Mechanics and problems	.....	a 5	Gymnastics	1	1
Natural sciences	2	.....	Total	35	35
Physics	2	2			

a During six months only.

The manual training in this school is as follows :

First year.—Properties of raw materials used in the work; the tools, their names, uses, and care; wood work—the various kinds of wood used in the industries, their classification, native and foreign wood, resinous woods, fine wood, hard and soft wood, their qualities and their defects, their uses; exercises in sawing in straight and parallel lines according to given directions (for instance, constructing a pine wood frame); joining—tenons, mortises, dovetailing, joining by means of slit and tongue; employment of these systems of joining in the execution of work; all work must be done from drawings.

Second year.—Continuation and further development of last year's work; lathe work, nature and care of tools, cutting of bodies in rotation; executing objects having cylindrical, conical, and spherical surfaces; iron and brass work, nature and care of tools, exercises in

the use of the flat and square files; pupils must construct all their work from drawings.

Pupils who graduate from this school are eligible for admission to the industrial art school, the watchmaking school, the school of mechanics, the school of fine arts, the school of commerce, and the technical and pedagogic sections of the gymnasium of Geneva.

TRADE SCHOOLS.

These institutions being the most important for the training of workingmen and women and for fitting them for their vocations, much more attention has been given to them than to the other classes of industrial schools. As they differ greatly one from another in their organizations, programmes, aims, etc., they can best be described separately.

A striking feature of Swiss schools is the well considered specialization of the instruction which they impart. Science, art, literature, and language are studied, not as an end but a means, with an ulterior object in view—a utilitarian object, it is true, but clearly defined and openly avowed. Every branch of knowledge is prized and gauged according to its direct value in its applicability to some trade or gainful occupation. This explains the generosity with which these special schools are supported. The object is kept constantly in view to build up new industries or to extend those already established. The expenditures are made in accordance with strict business principles—it being believed that such expenditures have been the direct means of bringing into the country millions of capital.

SCHOOL OF WATCHMAKING AND MECHANICS, LOCLE.

This school was founded in 1868, and is a municipal institution. Its object is "to offer to young men who wish to devote themselves to the watchmaking industry, and also to workingmen who wish to complete their education, the means of making an apprenticeship thorough, and of acquiring such knowledge as they may have to utilize."

The course of study of the division for watchmaking comprises the manufacture of the various kinds of watches and all other work relating to the profession, also theoretical instruction; it covers three years. The practical work includes, successively, the manufacture of tools used in watchmaking, the rough work without the barrel or spring box, the rough work with the barrel, the mechanisms for winding, the wheel work, cylinder escapements, anchor escapements, adjusting and regulating. The work done includes key and stem-winders of various kinds, repeaters, watches indicating dates and phases of the moon, chronometers, and other complicated pieces. The theoretical work comprises: First year—algebra, elementary geometry, descriptive geometry, met-

allurgy, technical drawing, and theory of watchmaking; second year—algebra, geometry, trigonometry, industrial mechanics, technical drawing, and theory of watchmaking; third year—algebra, general mechanics, physics, electrotechnics, technical drawing, and theory of watchmaking.

The course of study of the division for mechanics comprises the manufacture of the various tools and machinery used in the watchmaking industry, and also other fine apparatus. The theoretical instruction is the same as in the division for watchmaking. This course comprises also three years. The practical work done includes, among other things, all kinds of smaller tools, steel rules and squares, compasses, tools for cutting and boring, screw gauges, various tools used in turning, measuring instruments, anvils for watchmakers, piercing and grooving machines, lathes, machines for cutting wheels, for stamping, and for polishing, etc.; also repairing all kinds of watchmaking tools and machinery.

The school is in session every day except on Sundays and holidays. There is no vacation. The work continues from 7 a. m. in summer and 8 a. m. in winter until 7 p. m., with an intermission of one and one-half hours at noon for dinner. About nine hours per week are devoted to theoretical instruction. All the other time is spent in the performance of practical work.

The teaching personnel consists of a director of the watchmaking school, who is also instructor of adjusting and regulating, theoretical work, and drawing; a director of the division for mechanics, who is also instructor of theoretical work and drawing; a teacher for the class in finishing; a teacher for the class in escapements; a teacher for the class in mounting the wheel work; a teacher for the class in rough work; a foreman for the division for mechanics, making a total of 7 persons.

At the close of the session of 1890-'91 there were 40 pupils in the watchmaking division, and 11 pupils in the division for mechanics. Of the former 32 were Swiss, and 8 were foreigners. At the close of the year they were occupied as follows: Two, tool making; 2, rough work without the spring box; 3, rough work with the spring box; 11, the mechanisms for winding; 8, wheel work; 1, cylinder escapements; 10, anchor escapements; and 3, finishing.

The total number of persons who have graduated from the watchmaking division since the founding of the school is 388. The number who have graduated from the division for mechanics is 3.

The latest statistics obtainable relating to the present occupation of former pupils are for the twenty years ending 1888. Up to this time 275 pupils had graduated.

ATIONS OF EX-STUDENTS OF THE WATCHMAKING SCHOOL, LOCLE.

Occupation.	Number.	Per cent.
icturers	26	9.46
ts or chiefs of workshops	27	9.82
s in the watchmaking industry	67	24.35
gn establishments	58	21.09
and repairers	49	17.82
making profession	30	10.91
	18	6.55
	275	100.00

ere located as follows: At Locle, 79; in the same canton l), 30; other parts of Switzerland, 32; other European 76; outside of Europe, 40; deceased, 18.

ninistration of the school is intrusted to a board appointed neral municipal council. Each year this committee or board etailed report to the council of the progress of the school. s of the cantonal and federal governments can take part in g the examinations, and can examine the expenditures of the l.

enses of the school are defrayed as follows: By tuitions; by the capital; and when needed by subsidies from the canton, l government, and from appropriations out of the city treas- pecial permanent fund is provided by donations, the inter- ich is utilized for scholarships to persons of small means.

the year 1890 the income and expenditures were as follows:

INCOME.

ppropriation	$1,134.84
of the bureau for stamping gold and silver, at Locle	250.90
	1,636.87
k done by pupils	672.35
eipts	61.53
bsidy	1,194.19
bsidy	1,487.91
	6,438.59

EXPENDITURES.

teachers and directors	4,188.10
materials	891.42
enses	1,369.35
s	277.92
	6,726.79

ion for regular pupils is 15 francs ($2.90) per month for na- Switzerland and 30 francs ($5.79) per month for foreigners. o take a course in adjusting and regulating only pay a

tuition of 150 francs ($28.95) for three months, and 50 francs ($9.65) for each additional month. Former pupils who reënter to take this course pay a tuition of 30 francs ($5.79) per month.

Regular pupils must be at least 14 years of age, and must have passed a satisfactory examination before being admitted. Applications are made to the president of the board. They must indicate the names of the applicants' parents or guardians residing in the city, and if the latter are not residents, the names of some citizens who will be responsible for the pupils. When the applications exceed the vacancies preference is given in the following order: To citizens of Neuchâtel (canton), of Switzerland, and foreigners residing in Locle; to citizens of Neuchâtel (canton), of Switzerland, and foreigners residing outside of Locle.

The supplies and tools bought for the pupils are charged to them. Parents or guardians are responsible for the damage done by pupils to furniture or the tools intrusted to their care. Pupils are put on probation for three months, and if found unfit for an apprenticeship the board will notify their parents to withdraw them from the school. General examinations are held each year of the practical and theoretical work covered during the period.

This school, when founded in 1868, was considered as an experiment. It began with 5 pupils and 1 teacher of practical and theoretical work. A teacher of the public schools taught the class in mathematics. On October 1 of the same year the attendance had increased and an instructor of rough work and mounting was added. March 1, 1870, an instructor of wheel work and escapements was added. The attendance in the meantime had increased considerably, and on May 1, 1875, another teacher for rough work was added to the school. Since then the number of teachers has been increased as the necessities required. During this period of time the watchmaking industry had undergone a great change. The hand work was replaced by machine work. In order to familiarize the pupils with these machines it was necessary to purchase them. Large expenditures were required for this purpose, but on account of government subsidies they could be met. At the present time the school is equipped with the latest machines and tools. The school proved to be a success from its very beginning. The federal subsidy made it possible to establish a school of mechanics in 1887, where pupils learn to make tools and construct the machines used in the watchmaking industry.

SCHOOL OF WATCHMAKING AND MECHANICS, CHAUX-DE-FONDS.

This school was founded in 1865. It is a municipal institution. Its object is to educate young men practically and theoretically in all the branches of watchmaking, and also in the construction and repair of tools and machinery used in watch manufacture.

The practical work in the division for watchmaking comprises, successively, preliminary work in turning and filing, making small tools, rough work, wheel work, mechanisms of stem-winders, simple pieces, complicated pieces, diverse escapements, finishing, mounting and adjusting, and regulating watches. The work includes all kinds of key and stem-winding watches, from the most simple pieces to calendar and repeating watches and chronometers. The theoretical work is apportioned as follows: Preparatory class—arithmetic and bookkeeping, geometry, and theory of watchmaking; first year—arithmetic, bookkeeping, mechanics, geometry, and theory of watchmaking; second year—algebra, geometry, trigonometry, physics, cosmography, mechanics, and theory of watchmaking; third year—algebra, theory of watchmaking, mechanics, and physics; special higher course—algebra, mechanics, and theory of watchmaking. Technical drawing forms an important feature of the instruction. The regular course is for three years; with the extra course, four years.

The practical work in the division for mechanics is apportioned as follows: First year—preliminary work, file work, turning, forge work, executing models for castings; second year—models for castings, file work, turning, forging, setting up and adjusting, apparatus for measuring, execution of simple dies and matrices; third year—setting up and adjusting, executing tools used in watchmaking, also other machinery, executing machines and instruments previously planned and designed by the pupil, dies and matrices, stamping; fourth year—fine instruments and physical apparatus, instruments for measuring, executing machines planned and designed by the pupil. The students in this division follow the same theoretical course as those in the division for watchmaking, except that the subjects of theory of watchmaking and of cosmography are replaced by technology, applied mechanics, chemistry, and metallurgy. In designing the pupils of this division have two additional hours of sketching (mechanical).

The average time per week devoted to theoretical instruction and drawing is—10 hours for the preparatory class; 12 for the first year; 12 for the second year; 8 for the third year; 7 for the fourth, or extra year. It is the same for pupils of both schools, except that those of the school of mechanics have two hours more per week in sketching. The rest of the time is devoted to practical work. The school is in session daily, except Sundays and holidays, from 7 a. m. in summer and 8 a. m. in winter until 7 p. m., with an intermission of one and a half hours at noon. There are fourteen days' vacation in the summer time.

The teaching personnel consists of a director, who is also instructor of theoretical branches and technical drawing; a teacher of preliminary work, rough work, and wheel work; a teacher of rough work mechanisms for winding, and complicated pieces; a teacher of escapements, finishing, mounting and adjusting, and regulating; a director of the division for mechanics, who is also teacher of drawing; a teacher for the

practical work in mechanics; a teacher for the class in mechanical manufacture of watches; a professor of mathematics; a teacher of bookkeeping, making nine persons in all.

Sixty-five pupils attended the school during the scholastic year 1890–'91. Ten left the school, of which 2 had finished a three years' apprenticeship, 6, a partial apprenticeship, and 2 had not attended long enough to have profited. This left 55 pupils at the school on June 30, 1891, who were then occupied as follows: Rough work and spring boxes, 11; mechanisms for winding watches, 8; wheel work, 1; complicated pieces, calendar watches, repeaters, chronometers, etc., 6; escapements, 7; testing and regulating watches, 8; the division for mechanics, 13; and higher theoretical studies, 1.

Since the foundation of the school, in 1865, until June 30, 1891, 472 pupils have attended.

No statistics could be obtained regarding the present occupations of former pupils. Nearly all are either in business for themselves, as manufacturers, repairers, or dealers, or are superintendents, finishers, examiners, or adjusters and regulators in watch factories. Pupils who have taken the whole course rarely if ever take any inferior positions, such as ordinary workingmen, in watch factories. They are skilled workingmen, and are regarded as such by the manufacturers.

The administration of this school is intrusted to a commission of twenty persons, named by the general municipal council. Each year this commission makes a detailed report of the progress of the school. A copy of this report is deposited with the archives of the nation, the canton, and the municipality.

The general expenses of the school are covered by tuitions, income from the capital for special cases, municipal appropriations, state appropriations, and federal subsidies.

During the year 1890 the income and expenditures of the school were as follows:

INCOME.

Municipal appropriation	$3,454.70
State appropriation	1,170.06
Federal subsidy	1,775.00
Tuitions	1,354.19
Income from capital and sundries	441.70
Total	8,196.25

EXPENDITURES.

Salaries of director and teachers	5,523.47
Tools, materials, and furnishings	1,074.88
General expenses	1,597.90
Total	8,196.25

The tuition for natives of Switzerland and pupils of foreign birth whose parents reside in Switzerland is fixed at 15 francs ($2.90) per month during the first two years of apprenticeship, 10 francs ($1.93) per

month during the third year, and 5 francs (97 cents) per month during the fourth year. For foreigners the tuition is 25 francs ($4.83) per month during the entire apprenticeship. Pupils must supply all their own small tools and furnishings. The heavy machinery is the property of the school. The work done belongs to the pupils. In the division for mechanics the tools and furnishings are the property of the school; at times pupils who show great zeal in their work receive compensation for pieces executed. Pupils of both divisions pay for the materials necessary for the instruction in drawing and theoretical branches. All tools and materials must be purchased at the school.

Pupils, to be admitted, must be at least 14 years of age, and must have passed a satisfactory examination. Applications are made to the president of the commission, and must contain the age and name of the pupil and the address of the parents or guardians who will be responsible to the commission. When pupils are non-residents some citizens of Chaux-de-Fonds must agree to be responsible for them. When the applications exceed the vacancies preference is given in the following order: To natives of Neuchâtel (canton) and Switzerland residing at Chaux-de-Fonds; to natives of Neuchâtel (canton) and Switzerland not residing at Chaux-de-Fonds; to foreigners residing in or outside of Chaux-de-Fonds.

Pupils must apply in writing one month in advance if they wish to leave the school before completing their course of study. They can leave only at the end of June and January of each year.

No pupil can dispense with the theoretical instruction without special permission of the commission. During the first three months of apprenticeship, if pupils are found to lack the necessary proficiency, their parents are notified to withdraw them from the school. Partial apprenticeships can be taken for special branches, such as in rough work, in wheel work, in mechanisms for winding, in simple pieces, in complicated pieces, in various escapements, in finishing, in mounting, and in regulating, when parents can not send their children to serve the entire time. Young men and workingmen who desire to perfect themselves in their particular branches may attend one, two, or three months according to their proficiency. Free scholarships are provided for out of a special fund donated to the school. Pupils who intend taking an apprenticeship in watchmaking may take a partial apprenticeship of one year in the division of mechanics in order to make themselves more proficient in that branch of the profession.

At the expiration of each scholastic year, in accordance with the custom in schools of this class in Switzerland, a general examination takes place, and prizes are distributed to such pupils as distinguish themselves in any particular branches. At the last examination, June 26 and 27, 1891, nineteen such prizes were distributed. Pupils who desire to have a certificate of capacity upon leaving the school must submit to a special examination in the presence of examining experts taken

from outside the school. The following classes of certificates are issued: A diploma, called the diploma of honor; a warrant of capacity, first degree; a warrant of capacity, second degree; and a certificate of education.

SCHOOL OF WATCHMAKING, NEUCHÂTEL.

This school was founded in 1871. It is a municipal institution. Its object is "to offer to pupils and to workingmen in the watchmaking industry the means of acquiring the necessary theoretical knowledge, and as nearly as possible a practical training in their profession."

Pupils are divided into two categories—those who wish to take a complete course in watchmaking and those who desire to study only one particular branch of the profession, or workingmen who desire to perfect themselves in their particular lines of work. There is also a higher course for persons intending to become experts or superintendents in watch factories.

Pupils of the first category, those taking the complete watchmaking course, attend three years and are divided into three classes:

First year.—Rough work, mechanisms of winding, wheel work. Pupils make such small tools as can be executed with the file and the lathe. Each pupil must make six pieces of the rough work, the parts used for the winding and the mechanisms properly set, and various kinds of wheel work. Finally, they must prepare the wheel work for six stem-winding watches, which work is presented for the first year's examination.

Second year.—Escapements. The pupils must make the small tools used in this work, must learn to set the jewels, and must make several cylinders and an assortment of anchors; then they finish cylinder and anchor escapements, and set them in the six stem-winding watches. This work is presented for the second year's examination.

Third year.—Finishing, adjusting, testing, and repairing. The pupils make the small tools used in this work. They learn to finish key and stem-winding watches, and to regulate them. They then test and finish the pieces. The six pieces commenced in the previous years are then finished, regulated, and tested, and finally presented for examination at the end of the third year.

Finally those who wish to make chronometers and other complicated pieces may continue at the school and pass an examination for a special diploma. The pupils of the second category may take any one of the above branches of work. Their time at school depends upon the nature of their work and their practical experience as workingmen.

The theoretical work (mathematical course) comprises the following studies:

Preparatory class (3 hours per week).—Arithmetic—fundamental operations with whole numbers, fractions and decimals, powers and roots, applications; algebra—elements of literal calculations; geometry—definitions, plane (first part).

First year class (3 hours per week).—Arithmetic—proportion, progression, logarithms, divers rules; algebra—equations of the first degree with one or more unknown quantities, powers and roots of algebraic quantities; geometry—plane (second part).

Second year class (4 hours per week).—Algebra—equations of the second degree with one unknown quantity; geometry of space; mechanics—preliminary studies, uniform and varied motion, weight, parallel and opposite forces, exercises; physics—general properties of matter, attraction, elasticity, laws of equilibrium, hydrostatics.

Third year class (4 hours per week).—Algebra—equations of the second degree with several unknown quantities, etc.; plane trigonometry—principles, resolution of triangles; mechanics—divers motions, centre of gravity, resultants of forces, forces and living powers, the pendulum, laws of friction; physics—heat.

Special higher course for aspirants for expert's diplomas (4 hours per week).—Infinitesimal calculus; analytical geometry—principles, straight lines, circumferences, ellipses, divers curves; mechanics—divers theorems, engines, dynamic equilibrium; physics—acoustics, optics.

The course in theory of watchmaking is as follows:

First year class (2 hours per week).—General functions of clocks and watches; principles, motive forces, wheel work.

Second year class (2 hours per week).—Gearing; mechanical studies; escapements, general functions; special studies of anchor and cylinder escapements.

Third year class.—Various escapements; theory of regulating.

Special higher course.—Studies in regulating; Phillip's theory; compensation of watches and clocks, etc.

The course in electricity, first year (1 hour per week), embraces sources of electricity; effects, laws, and measurement of electric currents; practical application to watchmaking; classification of electric watchmaking; system of reporting time by electricity. Second year (1 hour per week), complete study of the various systems for electrical clocks; correction of habitual faults; electrical registering; telephones; electric light.

The course in cosmography (1 hour per week) embraces general studies of planetary bodies; celestial motions; laws; astronomical instruments.

The course in French language for natives (1 hour per week) embraces reading selected pieces; definition and spelling of words; dictation; exercises in composition. Course for foreigners (1 hour per week), exercises appropriate for the pupils according to the extent of their knowledge of the French language.

The course in technical drawing (4 hours per week) includes elementary draughting; gearing, escapements; copying machinery from the objects; plans and profiles; calibers of watches and clocks.

The school is in session from 7 a. m. in summer and from 8 a. m. in

winter until 7 p. m., with an intermission of one and one-half hours at noon. Each year there is a vacation of two or three weeks.

The teaching personnel consists of a director, who teaches in practical and theoretical work, two instructors of practical work, and three professors of theoretical branches.

The attendance since the foundation has been 144 pupils, of whom 20 were at the school at the close of the year 1891. No record is kept of their present occupations, but it is thought that nearly all are in the watchmaking industry.

The administration of this school is confided to a commission named by the general council of the municipality. Each year it presents a detailed report of the progress of the school. This commission consists of 15 members, three-fifths of whom are chosen from among the watchmakers and the rest from the school board.

The expenses of the school are defrayed by subsidies from the nation, the canton, and the municipal appropriations, by tuitions, and by voluntary donations. During the year 1890 the income and expenditures were as follows:

INCOME.

Municipal appropriation	$882.78
Cantonal subsidy	772.00
Tuitions	332.92
Federal subsidy	747.88
Total	2,735.58

EXPENDITURES.

Salaries of director and teachers	2,341.00
Tools and materials	211.87
General expenses	182.62
Total	2,735.58

The tuition is 5 francs (97 cents) per month for Swiss citizens and 20 francs ($3.86) per month for aliens. Pupils whose parents are residents and electors of the city have the preference. Small tools must be furnished by the pupils. Fixed tools and machinery are furnished free by the school. Pupils are held responsible for any damage to property. Pupils must be at least 13 years of age when admitted. Pupils can not leave the school without giving notice one month in advance. Theoretical instruction is compulsory.

SCHOOL OF WATCHMAKING, FLEURIER.

This school was founded in 1850. It has existed as a municipal institution since 1875.

The course of instruction comprises, successively, all the different parts of work done in the profession—tool making, rough work with mechanisms for winding, wheel work, anchor escapements, finishing

and regulating, plain and calendar watches. The theoretical instruction is simple, and includes such branches as are necessary in the practical work. The course properly requires about three years, but most pupils learn only certain parts, remaining for one year or a little longer. Theoretical instruction is compulsory.

The hours of work are from 7 a.m. to 7 p.m. in summer and from 8 a.m. to 8 p.m. in winter, with an intermission of one hour at noon. The school is in session daily except on Sundays and holidays. The time spent in theoretical work varies greatly, but averages about eight hours per week.

The teaching personnel consists of two instructors, who have charge of both the practical and theoretical instruction.

At the close of the year 1891 there were 13 pupils at the school; 139 pupils have attended the school since it was founded. No record is kept of the present occupations of former pupils. Nearly all are supposed to be still in the watchmaking industry.

The administration of this school is intrusted to a commission named by the general council (municipal). Each year this commission makes a detailed report of the progress of the school.

The general expenses of the school are covered by tuitions and by subsidies from the state and the municipality. This is the only watchmaking school that receives no federal subsidy. During 1890 the income and expenditures were as follows:

INCOME.

Cantonal subsidy	$772.00
Municipal appropriation	289.50
Tuitions	193.00
Various receipts	28.95
Total	1,283.45

EXPENDITURES.

Salaries of teachers	1,138.70
Tools	38.60
General expenses	106.15
Total	1,283.45

The tuition for natives of Switzerland is 10 francs ($1.93) per month; for foreigners it is 25 francs ($4.83) per month.

Pupils before entering must be 13 years of age and must present a certificate of education. Applications are made in writing and must be accompanied by the names and addresses of the parents or others resident in Fleurier who will be responsible for the applicants. Pupils must furnish the necessary materials and tools for their instruction. They must also pay for lighting.

SCHOOL OF WATCHMAKING, SOLEURE.

This school was founded in 1884. It is a municipal and state institution.

The practical work consists, successively, of rough work, wheel work, cylinder and anchor escapements, finishing, regulating, and testing of watches. Pupils who have successfully passed through the three years' apprenticeship may take a special course in watch repairing. Workingmen who desire to perfect themselves may attend six months or a year, according to their previous attainments. These may take a course in only one branch if they desire.

The theoretical work comprises theory of watchmaking, mathematics, physics, drawing and bookkeeping, and the French and German languages. Special instruction is also given in the Italian and English languages. This is optional with the pupils, and a charge of 5 francs (97 cents) per year is made for each language. Intercourse between the pupils and teachers is conducted in both the German and French languages.

The school is in session daily, except Sundays and holidays, from 7 a. m. in summer and 8 a. m. in winter until 7 p. m., with an intermission of one and one-half hours at noon. There are fourteen days' vacation in summer. All the time not taken up in theoretical work is spent in the workshops. All studying must be done outside the school hours.

The teaching personnel consists of a principal, receiving a yearly salary of 3,300 francs ($636.90); one assistant, receiving annually 900 francs ($173.70) for eight hours' instruction per week; one assistant, receiving annually 150 francs ($28.95) for two hours' instruction per week. Instruction in the optional courses is given at the state college by professors employed there. During the scholastic year ending April 30, 1891, 11 pupils attended the school. One pupil graduated during the year. The total attendance since the foundation was 76 pupils. No record is kept of the present occupations of the graduates. Most of them remain in Switzerland occupied in watch factories, others are watch repairers, and about 25 are in the watchmaking business for themselves.

The affairs of the school are administered by a commission of 7 members, 3 of whom are selected by the cantonal and 4 by the municipal government. The president, vice-president, and secretary of this commission constitute the executive committee.

The expenses of the school are covered as follows: By a federal subsidy, by a cantonal subsidy, by the community, by the municipality, by tuitions, and by donations.

During the scholastic year ending April 30, 1891, the total expenses of the school were 10,827 francs ($2,089.61). The tuition is 5 francs (97 cents) per month for natives and 25 francs ($4.83) for foreigners.

ee scholarships are sometimes given to poor, deserving pupils. The ols and other materials for the practical and theoretical work are fur-shed at the expense of the pupils. The work done belongs to the ipils, although the school commission reserves the right to designate iat is to be done. The heavy tools and machinery belong to the hool.

Pupils to be admitted must be at least 15 years of age and must have mpleted the primary education required by law. They must pass a eoretical examination, and later a practical test, before entering fully ion the apprenticeships. The latter test is made after the first three onths of attendance at the school, and upon this depends whether the ipil remains, and if so, whether he can be permitted to take a whole or partial apprenticeship in watchmaking. Pupils enter into a contract apprenticeship, and if they leave before the expiration of this contract fine not exceeding 10 francs ($1.93) per month for the unexpired time ay be exacted by the commission.

SCHOOL OF WATCHMAKING, BIENNE.

This school was founded in 1872, and is one of the municipal and state stitutions. It has two divisions—watchmaking and fine mechanics. The practical work in the division for watchmaking comprises, successively, rough work and mechanisms for winding, about 14 months; ieel work, about 4 months; escapements, about 12 months; finishing, gulating, testing, and mounting repeaters, chronographs, calendar itches, etc., 6 or more months. Instruction in complicated pieces is itional, and is only given when the pupil shows special proficiency.

The practical work in the division for mechanics comprises tools ed in the watchmaking industry, machines for mechanical work, and merican lathes. The course continues about three years. All inruction is given in the French and German languages.

The theoretical instruction, which is the same for both divisions, comises the theory of watchmaking, mathematics, mechanics, kinematics, iysics, chemistry, cosmography, technical drawing, and bookkeeping. Each pupil before entering the watchmaking school passes three onths in the mechanical department. The school is in session daily, cept Sundays and holidays, from 7 a. m. in summer and 8 a. m. in inter until 7 p. m., with an intermission of one and one-half hours at ion. The time devoted to practical and theoretical instruction varies. ie average is about 45 hours' practical work and 12 hours' theoretical ork in winter, and 51 hours' practical work and 11 hours' theoretical ork in summer. At the present time (August 1891) there are four isses in theoretical work.

The teaching personnel consists of a director, who is also instructor drawing and theory of watchmaking, a professor of mathematics, a ofessor of bookkeeping, two teachers of practical work, and one mas-r mechanic.

In August 1891 when the school was visited there were 28 pupils in

the watchmaking school and 10 in the school for fine mechanics. Since the foundation of the school about 350 pupils have attended.

No statistics could be obtained regarding the present occupations of former pupils. It is estimated that about 70 per cent. remain in the watchmaking industry. Many graduates are in foreign countries.

The affairs of the school are administered by a commission of 13 members, of whom 5 are named by the canton and 8 by the municipality of Bienne. The president, vice-president, and secretary constitute the executive committee.

The school derives its income from tuitions, a cantonal subsidy, municipal appropriations, voluntary donations, and federal subsidies.

During the scholastic year 1890–'91 the expenses of the school were 28,114.41 francs ($5,426.08) and the income 28,967.85 francs ($5,590.80).

The tuition is 10 francs ($1.93) per month for natives of Switzerland and 25 francs ($4.83) for foreigners.

The tools and materials necessary for the practical and theoretical work are furnished at the expense of the pupils. Only the larger machines and tools belong to the school. The products of the school belong to the pupils, but the school has the right to order a certain number of pieces which must remain as school property. Pupils are also invited by the commission to leave samples of their work in the school museum.

Pupils taking the course in mechanics furnish neither tools nor materials, but the work done belongs to the school. The materials for drawing and theoretical instruction are furnished by the pupils.

Pupils in order to be admitted must be at least 14 years of age, and must have finished the primary education prescribed by law. Candidates are examined for admission.

SCHOOL OF WATCHMAKING, PORENTRUY.

This school was founded in 1883. It is one of the municipal and state institutions.

The complete apprenticeship covers a period of three and a half years. It comprises, successively, rough work, mechanisms for key and stem-winding, wheel work, cylinder and anchor escapements, and finishing, mounting, regulating, and testing watches. For partial or special apprenticeships the work includes jewel setting, escapement work, pivot work, finishing escapements, regulating, etc., and the course covers from one to two years according to the branch taken and the proficiency of the pupil. All time lost, whether justified or not, must be made up after the expiration of the term of apprenticeship. The theoretical instruction comprises theory of watchmaking, arithmetic, bookkeeping, and drawing.

The school is in session in summer from 7 a. m. to 7 p. m., with two hours' intermission, and in winter from 8 a. m. to 6.30 p. m., with one and a half hours' intermission. It is open daily except Sundays and holidays, and three weeks' vacation.

The teaching personnel consists of a director, who is also instructor of practical work, one instructor of practical work, a professor of arithmetic, one of bookkeeping, and one of drawing.

On May 1, 1890, 9 male and 9 female pupils attended the school. They were at work as follows: One at finishing, 2 at placing anchor escapements, 1 at pivot work and finishing cylinders, 1 at finishing cylinder escapements, 5 at setting escapements, 3 at regulating, and 5 at cylinder pivots. During the year following 9 of these finished their apprenticeships, and all of them easily found positions. One was permitted to leave before the expiration of his term. At different times during the year ending April 30, 1891, 8 new pupils entered, leaving at the end of the scholastic year 16 pupils. The maximum number at any one time during this year was 23 pupils.

No record is kept of former pupils' present occupations. Nearly all are occupied in the watchmaking industry.

The administration of the school is in the hands of a commission of seven members, three of whom at least must be watchmakers. Three of them are named by the state, three by the municipality, and one by the communes which subsidize the school. The president, vice-president, and secretary constitute the executive committee.

The expenses of the school are covered by state subsidies, subsidies from communities of the district of Porentruy, tuitions, private donations, and federal subsidies.

The following is the budget from January 1 to December 31, 1890:

INCOME.

Brought forward from last year	$336.75
Subsidies:	
State of Bern	482.50
Municipality of Porentruy	386.00
Federal government (500 francs special)	579.00
Communities of the district	69.96
Tuitions	192.29
Furnishings, sale of, to pupils	111.44
Commissions on work sold for pupils	48.55
Sale of surplus stock of watches	57.90
Total	2,264.39

EXPENDITURES.

Salary of director	636.90
Salary of teacher of practical work	579.00
Salaries of teachers of theoretical work	138.58
Rent of building	38.60
Interior expenses, heating, lighting, etc	70.86
Furnishings (tools, etc.) to be sold to pupils	152.97
Purchase of tools for the school	10.81
Furniture	40.48
Total	1,668.20

The tuition is from 5 to 20 francs (97 cents to $3.86) per month, the amount depending upon the circumstances of the pupils and of the

school itself. In the case of worthy pupils with small means the tuition is sometimes partially or entirely remitted by the commission. The materials and smaller tools are furnished at the expense of the pupils. The pupils obtain the proceeds from the sale of their work, but a commission of 20 per cent. is charged for the use of the larger tools and machinery owned by the school.

Pupils in order to enter the school must be at least 14 years of age and must possess the education prescribed by law for pupils leaving the primary schools. They are not admitted when over 22 years of age. Pupils enter into a contract of apprenticeship with the commission of the school. When pupils are non-residents they must name some one in Porentruy who will be responsible for them. During the first three months pupils are on probation, and may be dismissed if found incompetent for the work.

SCHOOL OF WATCHMAKING, SAINT IMIER.

This school was founded in 1866. It is one of the municipal institutions of Saint Imier.

The instruction comprises, successively, rough work, wheel work, escapements, finishing, regulating, and testing.

The first year is devoted to making rough work, wheel work, and the mechanisms for winding; the second year, to anchor and cylinder escapements, making and finishing the parts, and setting and mounting them; the third year, to finishing and mounting, incasing, regulating, and repairing watches.

The theoretical work comprises the following courses:

First year.—Algebra and trigonometry, two hours; mechanics (statics), one hour; geometry, one hour; theory of watchmaking (time and its units; true time, mean time, sidereal time; definition of a timepiece; principal organs—(1) the motive force, (2) wheel work, (3) escapements, (4) regulators—first part: motive force—weights and springs; second part: wheel work—determining the diameters of wheels and pinions, determining the distance of centres of rotation, determining the form of the toothed wheels and the fly of the pinions), two hours; drawing (geometrical figures—their properties (1) in a plane, (2) in space; projections, etc.; drawing the curves of gearing, cycloids, epicycloids, hypocycloids, the evolvent of the circle), four hours.

Second year.—Mechanics (dynamics), two hours; cosmography (of the sphere, solar system, diurnal and annual rotations of the earth, measurement of time, sun dials, latitude, longitude, determining longitude by the chronometer), one hour; theory of watchmaking (third part: escapements—study of anchor, cylinder, and other escapements), two hours; drawing (shading in ink, gearing employed in watchmaking, drawing cylinder, anchor, and other escapements, drawing of parts in the horizontal, vertical, and profile), four hours.

Third year.—Mechanics (practical study of the transmission of motion), two hours; physics (heat, compensation, optics, principal instru-

ments, electricity, electric clocks, telegraphy, chemistry, study of metals used in watchmaking, alloys), one hour; theory of watchmaking (fourth part: regulators—the pendulum, determining the excess of teeth in wheels and the flies of pinions, plans of calibers, etc.; review of the whole subject), two hours; drawing (draughting tools and machinery, outlines of calibers, Phillips's curves).

The school is in session daily, except Sundays and holidays, from 7 a. m. to 6 p. m. in summer and from 8 a. m. to 7 p. m. in winter, with an intermission of one hour at noon for dinner. The theoretical instruction is given in the evening whenever it is possible. Theoretical work during the first year occupies ten hours a week, during the second and third years nine hours. The remainder of the time is given to practical instruction.

The teaching personnel consists of a director and teacher of the class in regulating; a teacher of the second year's class in escapements; two teachers of the first year's class in rough and wheel work; a teacher of the special class in escapements; a teacher of mathematics, bookkeeping, and commercial arithmetic; a teacher of the preparatory class in French, arithmetic, history, and geography.

At the end of the scholastic year, May 1, 1891, the attendance was 35 pupils, classed as follows: First year's class, 9 pupils; second year's class, 10 pupils; third year's class, 4 pupils; special class in escapements, 12 pupils. During the year 3 finished their three years' apprenticeship, and 6 completed the special course in escapements.

The present scholastic year, 1891–'92, opened with 51 pupils, of whom 20 attended the special class in escapements. No record is kept of the present occupation of former pupils. With few exceptions all are said to be engaged in the watchmaking industry.

The affairs of the school are conducted by a commission of nine members named by the municipal council and three members appointed by the state of Bern. Two-thirds of these must be watch manufacturers.

The expenses of the school are covered by tuitions, state subsidies, municipal appropriations, interest on the capital, private donations, and by federal subsidies. Following are the receipts and expenditures during 1890:

INCOME.

Municipal subsidy (Saint Imier)	$820.25
State subsidy (Bern)	1,158.00
Federal subsidy (Swiss government)	1,486.10
Tuitions	641.72
Private donations	692.87
Receipts from bureau for testing timepieces	12.83
Tools and materials sold to pupils	73.34
Sundries	6.91
Interest on special funds	25.48
Total	4,917.50

EXPENDITURES.

Salaries of director and teachers	2,577.05
Rent, janitor, lighting, and heating	646.84
Purchase of tools and furniture, and repairs	576.76
Materials for instruction	206.18
Library	71.09
Bureau for testing timepieces	142.23
Tools and materials to be sold to pupils	156.42
Museum	128.17
Sundries	287.84
Payment on debt (first mortgage)	138.34
Deficit of last fiscal year (1889)	173.70
Total	5,104.82
Excess of expenses	187.12

The value of the stock and of the special fund is estimated at 28,771.07 francs ($5,552.82).

The tuition varies with the circumstances of the pupils and the financial condition of the school. It averages about 10 francs ($1.93) per month. The rates are made by the commission. The commission may remit the tuition, partially or entirely, in cases of deserving persons without means.

Before being admitted pupils must be at least 14 years of age and must have finished the primary education prescribed by law. They must, in addition, pass an examination for admission. A contract of apprenticeship must be signed by the parents or guardians residing in the district. Pupils leaving before the termination of this contract must pay a fine, determined by the commission, which fine can not exceed the amount that would have been paid for tuition during the unexpired time.

The work done by the pupils belongs to them, but they must pay for all the tools and materials that they use except the larger machinery. Pupils often donate certain pieces to the school museum.

The first three months pupils are on probation, and may be dismissed if found incompetent. Pupils taking special courses, such as in escapements only, may be apprenticed for a shorter time than three years.

SCHOOL OF WATCHMAKING AND MECHANICS, GENEVA.

This is a municipal institution. The object of the watchmaking division is "to give complete instruction in the art of watchmaking, so as to make able and well informed watchmakers, thereby increasing the prosperity and renown of the Geneva work." The division for mechanics aims "to give workingmen in that line a more complete theoretical knowledge than can be obtained in workshops, together with a practical training."

The theoretical instruction in the watchmaking school comprises mathematics, mechanics, kinematics, technical drawing, elements of

ysics and chemistry, astronomy, and theory of watchmaking. In-
ruction in bookkeeping is optional. The practical work comprises
o divisions—the superior and the inferior. The inferior apprentice-
ip comprises the following work, covering, in all, three years:
ugh work, mechanisms for winding, wheel work, cylinder and anchor
capements, work by the mechanical process. The superior appren-
eship can be taken only after having finished the inferior. It com-
ises the following work, covering two years: Class in escapements,
nstruction by the mechanical process (machine work), movements,
ishing and regulating. In this division pupils have the liberty of
oosing the class which they desire to enter. Otherwise all instruction
obligatory. The superior apprenticeship is intended for persons who
sire to fit themselves for directors of workshops.

In the mechanical school the theoretical work comprises mathemat-
, mechanics, physics, chemistry, elements of descriptive geometry,
chnical drawing and its application to the work. Bookkeeping is
tional, all else is compulsory. The practical work comprises three
visions: Elementary division—metal and wood work without the use
machinery; intermediate division—machine work, fitting; superior
vision—instruments of precision and physical apparatus. Pupils of
is last division can make a specialty of watchmaking machinery, in
hich case they enter the watchmaking school for practice in the ma-
inery there. They follow the theoretical work of the school of
echanics, however. The course of study in the school of mechanics
vers three years.

The faculty of the two schools consists of a director, who also gives
eoretical instruction; one teacher of rough work; one, of escapements;
e, of wheel work; one, of mechanisms for winding; one, of move-
ents; one, of finishing and regulating; one, of machine work; a
acher of mechanics and an assistant.

The attendance during the year ending June 30, 1891, was 50 pupils
the school for watchmaking and 30 in the school for mechanics,
aking 80 pupils in all; of these 21 were foreigners.

With few exceptions the pupils remain in some capacity in the
atchmaking industry, either as manufacturers, superintendents, fin-
ers and regulators, or as merchants or repairers of watches.

This school is a municipal institution and under the jurisdiction of
e administrative council. For the administration and general
pervision the administrative council is assisted by a consulting com-
ttee of twenty members, appointed by the administrative council,
mposed as follows: Three nominated by the manufacturers' asso-
ation, three by the watchmakers' association, two by the society of
ts, and twelve nominated by the council itself. The administrative
uncil, with the advice of this committee, appoints all functionaries
the school, makes all interior regulations, prepares the programmes,
d determines the duties of officers and employés. The consulting

committee has supervision over all that concerns the instruction and interior administration of the school. Once a year it makes a report of the progress of the school. For the government and supervision of the school for mechanics the administrative council is assisted by a committee of five members, appointed for two years by the said council. The duties of this committee are similar to those of the one appointed for the watchmaking school.

The expenses of the school are defrayed by a sum annually carried in the budget of the city, by federal subsidies, and by tuitions. The income and expenses as shown by the budget of 1891 were as follows:

INCOME.

Federal subsidy	$3,019.80
Tuitions	868.50
Municipal appropriation	5,885.22
Total	9,773.52

EXPENDITURES.

Salaries of seven teachers of practical work	4,863.60
Theoretical instruction (given by the director)	965.00
Salaries of the instructor and assistant of the school for mechanics	1,003.60
Salary of *concierge* (janitor) and materials for cleaning	347.40
Repairs of machinery, tools, etc	386.00
Purchases of tools	1,158.00
Supplies for the classes for mechanics	231.60
Tools awarded to Geneva pupils	154.40
Sundry expenses, compensations, etc	663.92
Total	9,773.52

The tuition for either school is 5 francs (97 cents) per month for natives of Switzerland and 25 francs ($4.83) per month for foreigners. Children of foreigners who have lived in Geneva at least six years are admitted for the same tuition as Swiss children. An extra charge is made for the superior division of the watchmaking school, but the amount varies.

To be admitted pupils must be at least 14 years of age for the watchmaking school and 15 years for the school for mechanics; they must apply in writing to the administrative council, and must have an education corresponding to that received in the first year of the *école professionnelle* (high school) of Geneva for the watchmaking school and to that received in the second year of the *école professionnelle* of Geneva for the school for mechanics. The parents or guardians of the pupils must agree in writing to the regulations of the school, and are held personally responsible for any damages caused by the pupils. Parents who do not live in Geneva must find some resident who will assume this responsibility. Workingmen desiring to perfect themselves in any one branch can be admitted by special authority of the council. Some of the tools, such as machines or larger articles,

are furnished by the administration, while smaller tools must be paid for by the pupils.

The committee of consultation designates each year a jury for conducting the examinations. This jury reports to the committee. A separate jury is selected for each of the two schools. The juries also decide upon the special awards to be given to pupils of their respective schools. The pupils who have passed satisfactorily their apprenticeship, either in the inferior or superior divisions of the watchmaking school or the school for mechanics, obtain a certificate indicating the percentage obtained in each branch of their work. Money prizes are awarded to the most meritorious pupils. These are generally provided by watch manufacturers or others desirous of encouraging the pupils.

SCHOOL FOR CARPENTERS AND SHOEMAKERS, BERN.

This institution was founded in 1888. It is a municipal institution. The object, according to a resolution of the municipal council, is "to enable young persons leaving school to thoroughly learn some useful trade; to meet the increasing working force of foreign labor by placing the domestic labor on a higher plane of efficiency; to elevate skilled labor in general by giving to workingmen a thorough training in the theoretical, artistic, and practical features of their work; and, further, to investigate and place before the members of the various trades the results of the latest industrial improvements."

Although the object of the institution is to encourage all the various trades, such as carpentry, shoemaking, tailoring, iron work, etc., it has not yet been possible to establish workshops for more than the first two trades.

The following is a detailed programme of the work in the shoemaking department:

First half of first year—hand work on uppers; cutting soles, shaping bottoms, and performing other work relating thereto; determining the different qualities of sole leather. Second half of first year—repetition of previous work; finer bottom work with edging; nailed bottom work; shoe repairing.

First half of second year—repetition of previous work; more difficult bottom work with edging; fancy bottom work. Second half of second year—repetition of previous work; making plaster casts of feet; study of the anatomy of the foot; last making; practical and economical cutting of hides; making uppers; sewing machine work.

First half of third year—repetition of previous work; simple work according to measure; taking measurements; constructing lasts according to plaster casts and measurements; cutting patterns according to the geometrical system; study of the various ways of treating the feet; study of the materials used in shoemaking; introduction and use of auxiliary machines; reckoning the cost of production; fancy work on uppers. Second half of third year—repetition of previous work;

ordinary and artistic tanning; studying the effects of tanning on the qualities of leather; designing new models and styles of shoes; estimating cost and materials necessary for establishing a shoe store or factory; intercourse with customers; learning the sources from which raw materials are obtained; manner of storing and preserving stock; all the details of shoe manufacturing.

The theoretical work in this department consists of drawing, bookkeeping, business correspondence, and French language. Special attention is given to the best methods of utilizing the different parts of hides and cutting them economically. Pupils who have advanced sufficiently to make entire shoes take the measurement of the feet of customers and take the orders in the presence of an overseer. The same pupil who does this cuts the hides and prepares alone every part of the shoe. While doing so he estimates and keeps strict account of the cost of every part as well as of the value of his time and of the other materials. When the pair of shoes is finished he renders a detailed account of the cost of production of the same.

The following is a detailed programme of the work in the carpentry department:

First half of first year—sawing, planing, and chiselling; completing simple articles, such as shelves, footstools, and similar pieces. Second half of first year—setting, sharpening, and arranging tools and appliances; making articles requiring plane surface work.

First half of second year—fitting together plain pieces; veneering. Second half of second year—joining and building large pieces of furniture; joining veneered work; simple dovetailing; scroll work.

Third year—sketching pieces of furniture, drawing the plans and executing the work according to specified dimensions; instructions in taking measurements; small metal work, such as exercises in filing, tool making, etc; constructing patterns for machinery; building entire pieces of furniture of all styles; studies in reference to the uses of different kinds of wood in the various states of dryness; estimating cost of production; every detail of cabinetmaking.

The theoretical work, first year, consists of free-hand, technical, and geometrical drawing, and studying the different varieties of wood; second year, technical and ornamental drawing, modelling, and technology and stereometry; third year, technical and ornamental drawing, perspective, modelling, the orders of architecture, styles of ornamentation and their different historical periods, intercourse with customers, learning the sources from which materials are obtained, estimating the cost and materials needed for establishing a carpenter shop. Bookkeeping, arithmetic, correspondence, and German composition are optional.

In the workshops each pupil, as a rule, plans and finishes every piece of work he handles, and prepares his own drawings from specifications. Work rarely passes from one hand to another.

The school is in session daily, except Sundays and holidays, from 7 *a. m. to 6* p. m., with an intermission of one and one-half hours at noon.

per week are devoted to drawing and theory in the shoe-
partment and nine hours per week to drawing, modelling, and
the carpentry department; this is generally given in the
Every evening one hour is given to business correspondence,
ng, composition, and French language. The rest of the time
) practical work.

renticeship extends over two or three years in the shoemak-
tment and three years in the carpentry department.

hing personnel consists of a director, who is also chief instruc-
shoemaking department, an assistant director, who is chief
in the carpentry department, five instructors, two overseers,
pecialists.

1891 the attendance was 15 pupils in the shoemaking shops
pils in the carpentry shops. Since the opening of the schools
raduated from the shoemaking department after a two year
r a three year apprenticeship. Seven pupils graduated from
ıtry shops. Pupils who are not fitted for the more important
ıoemaking are compelled to terminate their apprenticeship
of the second year. Of the 10 graduates of the shoemaking
ıt 1 is in Lausanne, 1 in Geneva, 2 are in Bern, 1 in France,
nited States, and 4 could not be traced. The first 6 are all
t their trades as shoemakers. Of the 7 carpenters who fin-
r apprenticeships 6 are in positions as carpenters in Switzer-
seventh could not be traced.

ıicipal government of Bern has direct jurisdiction over this
ı. The affairs of the school are conducted by a commission
ersons selected by the municipal council.

ome of the institution is derived from the sale of finished
national subsidies, cantonal subsidies, and municipal appro-
The income and expenditures for the year 1890 were as

Shoemaking department.

INCOME.

hed products	$3,360.41
sidy	1,717.70
bsidy	1,717.70
ppropriation	1,732.02
	8,527.83

EXPENDITURES.

director and chief instructors	2,695.83
lies (books, drawings, etc.)	149.56
achines, tools, etc.)	855.74
ı (purchases and repairs)	233.35
ating, and janitor	503.23
midday meals for pupils	1,122.34
als and pay of some instructors and pupils	2,967.78
	8,527.83

Carpentry department.

INCOME.

Sale of finished products	$2,639.65
Federal subsidy	1,725.42
Cantonal subsidy	1,725.42
Municipal appropriation	1,738.74
Total	7,829.23

EXPENDITURES.

Salaries of director and chief instructors	2,382.14
School supplies (books, drawings, etc.)	199.31
Utensils (machines, tools, etc.)	1,134.83
Furnishings (purchases and repairs)	237.01
Lighting, heating, and janitor	426.77
Sustenance, midday meals for pupils	1,382.76
Raw materials and pay of some instructors and pupils	2,066.41
Total	7,829.23

All instruction is gratuitous. A dinner is furnished at noon to all pupils at the expense of the institution. Upon entering pupils are indentured as apprentices. If they leave the school, or are dismissed for bad behavior, before the expiration of the apprenticeship their parents are subject to a heavy fine. To be eligible for admission pupils must possess the requisite health and mental fitness for beginning an apprenticeship. They must present their certificates of education, showing that they have completed their term at school as required by law. A certificate of birth and one of good behavior must also be presented. In the beginning preference was given in the carpentry department to persons who had attended manual training schools, but it was soon discovered that they were not better in skill and efficiency, after the first few days, than other pupils. The preference was therefore removed.

An examination of the pupils and an exhibition of their work is held each year. Prizes and diplomas are distributed on these occasions. The commission which awards the prizes and diplomas sometimes admits to the prize competition the work of one and two year pupils.

In order to constantly encourage pupils to careful and diligent work a special system of compensation is provided for. A certain time value is fixed for the execution of each kind of article. Pupils are required to accomplish the work required in this time schedule. All work done properly in excess of the schedule requirement is paid for in money each week to the pupils performing it. This tariff system is considered a very important feature of the shop work, for it has been found that since its introduction pupils work more willingly and with greater zeal. All are anxious to make their first earnings in life as great as possible, and as a consequence they work to their full capacity.

The work, in order to be accepted, must be of a certain degree of excellence.

An interesting feature of this school is the salesroom where all articles are sold to the public and orders are taken. The aim of the commission is to sell the articles here as nearly as possible at the retail market price. Notwithstanding this, the sales generally equal the production. This is due to the fact that although the articles are not cheaper than at other establishments, they are known to be made of the best material, and made with the greatest care. The establishment of this salesroom aroused considerable protest on the part of shoe and furniture manufacturers on account of the competition it created. Various other schemes for disposing of the goods had been tried without success, and, as something had to be done with the product, this was found to be the best way out of the difficulty. It is considered that as the number of pupils is limited and as the same prices are maintained as in other stores, the competition of this school is not sufficient to justify the protests of the manufacturers. This is the view taken by the municipal government of Bern.

Besides the ordinary tools and accessories the workshops contain the latest improved sewing machines, a last making machine, and in the carpenter shops a large scroll saw. These are worked by a gas motor.

SCHOOL OF METAL WORKING, WINTERTHUR.

This school was founded in 1888 as a part of the industrial museum at Winterthur. It is a state institution. The object of the school is "to educate, by means of practical and theoretical training, able workingmen in the various branches of fine metal work." The course of instruction covers three years.

The practical work is as follows:

First year.—Preliminary work—exercises at the lathe, vise, forge, and auxiliary machines; simple iron work; practice in the handling of tools, the hammer, file, chisel, etc; simple tin and sheet iron work—folding, bending, stamping, riveting, and soldering.

Second year.—Practice in the execution of exact work, such as machinery, etc.; fancy mountings; simple rosettes; chisel work; executing forged tendrils, leaves, and flowers; tin and sheet iron work, especially for architectural pieces.

Third year.—In this year the work of the pupils depends upon their chosen professions: (1) For mechanics—executing exact tools and instruments, single parts for machinery, constructing simple machinery and apparatus, turning; (2) for building construction workers—ornamental mountings and locks, engraving and forging rosettes, trellises, and lattice ornaments; (3) for artistic iron workers—etching and engraving on iron, stamping and chasing various ornaments, leaves, and flowers in iron.

The theoretical work is as follows:

First year.—German language—exercises in reading prose and poetry, articulation, exercises in original composition, narratives and descriptions, attention being given to orthography, grammar, style, and penmanship; arithmetic—whole numbers, fractions and decimals, ratio and proportion, percentage, interest, discount, square and cube root, practical applications; geometry and geometrical drawing—the relations of points, lines, polygons, and circles, the measurement of lines and plane surfaces, geometrical drawing as far as it relates to metal work, ornamentation by lines and plane surfaces, engrossing; study of perspective—plane figures and geometrical bodies, elevations and sections according to scale, problems in lines and planes, intersection of lines, planes, and solids by other solids (in the performance of these exercises attention is also given to sketching without the use of the rule and compasses); physics—general properties of matter, mechanics, heat, its sources and nature, expansion through heat, specific heat, transmission of heat, the steam engine, magnetism, properties of the magnet, terrestrial magnetism; free-hand drawing—simple surface ornaments for metal work, shading in India ink, application of simple water colors.

Second year.—German language—exercises in reading and speaking, explanation of technical terms, practice in writing business forms, such as insertions, certificates, receipts, bills, orders, contracts, etc.; arithmetic—partnership, stock and coin calculations, compound interest, drafts and checks, accounts current; geometry and geometrical drawing—geometrical solids, measurement of surfaces and contents, drawing ellipses, spirals, screw threads, etc., cog constructions; perspective—taking up simple articles used in the metal industry, tools, etc., drawing according to scale, applications to drawing of tube work, cornices, etc.; physics—frictional and galvanic electricity and the most useful applications, light, its nature, reflection, refraction, the spectrum, the eye, optical instruments, elements of chemistry; technical drawing—iron fastenings, clamps, ties, screws, bolts, etc., mountings and sashes for windows, shutters and doors, locks (these from the blackboard, from copy, and from models), architectural profiles, etc.; free-hand drawing—forged and other metal work, especially of outlines from models and from copy.

Third year.—German language—exercises in reading, speaking, etc., business correspondence and intercourse, etc.; cost of production—calculating the weight and cost of metal work, making estimates on construction work; bookkeeping—object, arrangement, and books for single entry bookkeeping, keeping a set of books for an iron working establishment, etc.; technology of metals—study of raw materials, iron, steel, tin, zinc, lead, and copper, alloys, important productions of the metal working industry, tools and machinery used in the industry, arrangements and appliances for casting and forging; elements of ma-

chine construction—rules for constructing and drawing simple parts as fittings, appliances for transmitting motion, and other details, tools, apparatus, etc.; technical drawing—door panels, railings, trellises, iron doors and shutters, window frames, skylights, ceilings and supports, roof constructions, machinery, etc., from copy and models; free-hand drawing and modelling (apprentices in artistic iron work only)—plastic ornaments for artistic iron work, taken from casts, metal models, and copy, designing decorative metal work, modelling ornaments for metal work. Pupils are also permitted to take lessons in foreign languages at the cantonal technikum without extra charge.

The school is in session daily except Sundays, holidays, two weeks' vacation in April, and one week from Christmas to New Year's day. In the fall the theoretical work is sometimes dispensed with during a few weeks, the time then being entirely given to practical work. Following is the schedule of time given to each study per week:

COURSE OF STUDY.

Subject.	Hours per week.		
	First year.	Second year.	Third year.
Practical work	28	30	30
Theoretical work	24	23	23
German	2	2	2
Arithmetic	2	2	.....
Cost of production	.....	.....	2
Bookkeeping	.....	.....	2
Geometry and geometrical drawing	4	2	.....
Perspective	8	3	.....
Physics	2	2	.....
Technology of metals	.....	.....	1
Free-hand drawing	6	4	8
Modelling	.....	.....	4
Technical drawing	.....	8	12
Elements of machine construction	.....	.....	4

The instruction in free-hand drawing and modelling is only for pupils who take the apprenticeship in artistic iron work. These pupils dispense with the study of machine construction, and take only four instead of twelve hours in technical drawing during the third year.

The teaching personnel consists of a director, three instructors of practical work, and one teacher of theoretical work. The instruction in drawing and similar subjects and in bookkeeping is given at the cantonal technikum.

At the end of the year 1890, 42 pupils attended the school, of which 30 were apprenticed for the full term and 12 took special courses. There were no graduates when the school was visited, as it had existed only two and one-half years.

The affairs of the school are administered by a special committee of five members selected from among the board of trustees of the State Industrial Museum of Winterthur, of which institution this school is a branch. The school is supported by tuitions and by state and federal contributions.

An admission fee of 10 francs ($1.93) is paid upon entry, and 40

francs ($7.72) per year if they serve an entire apprenticeship, and 200 francs ($38.60) if a partial apprenticeship. Special rates are made for such as are not apprenticed, but simply attend for a limited time.

The following qualifications are required for admission: An age of at least 15 years; a certificate of graduation from the higher primary schools of Zurich (a total of 9 years' school attendance) or from schools of a similar grade; bodily strength. Pupils are on probation the first two months of attendance; if found incapable they are dismissed. Admission to the school is permitted as a rule only at the beginning of each scholastic year. In exceptional cases pupils are admitted for one year or more without the theoretical instruction if they have already obtained a theoretical education in some technical high school, or intend to visit one later. Apprentices and other workingmen who have but little time and money to spare can attend for a much shorter time, and may take only the practical or only the theoretical course or both. Intelligent worthy men may obtain entire or partial free scholarships, either as apprentices or for shorter courses.

SCHOOL FOR WOOD CARVING, BRIENZ.

This school was founded in 1883. It is a municipal institution. Its object is to educate young men for the profession of wood carvers by giving them the advantages of practical and theoretical instruction. The course of instruction comprises free-hand and technical drawing, modelling, composition, study of styles of ornamentation, and wood carving. Besides the usual styles of ornamentation special attention is given to the naturalistic style peculiar to that country, such as Alpine plants, animals, and other objects.

For the regular school of apprenticeship the hours of work are as follows: Free-hand drawing, first class, three hours, second class, six hours, per week; technical drawing, each class three hours; modelling, each class seven hours; designing, first class only, three to four hours; study of styles of ornamentation, three hours per week. The rest of the time is devoted to the shop work. The hours of work comprise ten per day. The apprenticeship covers, as a rule, three years. The school is in session daily except Sundays and holidays and two weeks' vacation in summer. Special evening classes in drawing and wood carving are in session two evenings each week in the winter months for persons of all ages who can not afford to attend the day school. Special afternoon classes for school-boys in elementary drawing are held twice a week after the regular school hours. The teaching personnel consists of a principal, who is also teacher of carving, one other teacher of carving, and one teacher of drawing and modelling.

At the close of the scholastic year 1889–'90 the attendance was as follows: Regular day apprentices, 13 pupils; special evening classes in drawing and wood carving, 27 pupils; special afternoon classes for school-boys (elementary drawing), 55 pupils; total attendance, 95 pupils.

No record is kept of pupils after leaving the school. Nearly all who serve the apprenticeship either remain in the vicinity to carve ornaments for tourists—an occupation peculiar to the mountain country in this vicinity and in Tyrol—or they obtain occupations in furniture manufactories for doing fine decorative work. The former generally live at home and sell their products either to traders or directly to the tourists.

The affairs of the school are administered by a committee of nine persons, three of whom are appointed by the canton Bern, three by the municipality of Brienz, and three by the Protestant church of Brienz.

The income of the school is derived from contributions from the Protestant church, from the municipality, from the canton Bern, and from the federal government.

The instruction is gratuitous. The wood, drawing materials, and all other school supplies, except carving tools, are also furnished gratis. An admission fee of 10 francs ($1.93) is required upon entering the school. Pupils who enter as apprentices deposit 50 francs ($9.65) as a security for serving out the entire time. At the end of the apprenticeship this amount is refunded. The work done by the pupils remains the property of the school. During the second and third year of the apprenticeship the pupils obtain one-half of the proceeds from the sale of the articles made by them. In exceptional cases, where pupils are worthy, this arrangement is made for first year pupils.

The day school is open to all persons under 30 years of age who have finished the primary education required by law. A contract of apprenticeship is required. No special conditions of age or education are made for afternoon and evening pupils.

SCHOOL OF SILK WEAVING, WIPKINGEN NEAR ZURICH.

This school was founded in 1881. It is owned by the Association of Silk Manufacturers of Zurich and vicinity. Its object is to perfect young men in the higher branches of work of the silk weaving industry, such as mill superintending, and work in the designing, arranging, and finishing departments. It is also intended for the education of manufacturers and dealers of silk textiles.

The course of study covers two years as follows:

First year.—Plain weaving (*Schaftweberei*). Practical work: Hand weaving—winding, warping, drawing-in, piecing, preparing looms, card making, spooling, harness mounting, weaving on the Zurich and Lyons looms, velvet, gauze, and ribbon looms, with the hand and fly shuttle, shaft machine, etc., manufacturing taffetas, serges, satins, armures, velvets, plushes, gauzes, pekins, bayadères, and checked goods; power loom weaving—building, fitting, adjusting, and taking apart power looms, winding, warping, and spooling, preparing, arranging cards, etc., weaving on the power looms, plain and treadle work, etc., manufacturing taffetas (pupils may also begin on the Jacquard loom),

simple and combined treadle work, etc. Theoretical work: Lectures—historical development of the silk industry and its present condition in the different countries, silk culture, spinning, twisting, grading of fineness, drying of raw silks, properties, classification, and means of dyeing silks (the school possesses contrivances for illustrating the methods of spinning and weaving silks), on preparing silk and half silk tissues; instructions in drawing-in and piecing, the weaving, finishing, and uses of silk textiles, such as taffetas, serges, satins, armures, bayadères, pekins, and carreaux, velvets, plushes, and gauzes, mill bookkeeping and calculating; theory of hand loom weaving—description and explanation of the various looms, utensils, and work connected with hand loom weaving and preparation of plans and drawings of the same; theory of power loom weaving—description and explanation of the various looms, auxiliary machines and contrivances connected with shaft loom weaving, and preparation of the necessary drawings, instruction in mechanics, the parts of weaving machinery, and technical drawing; free-hand and pattern drawing—instructions in drawing from copy and in designing striped and checked patterns, science of colors (this part is intended to educate the taste for form and color; such pupils as intend to become pattern designers may increase the time spent in this work by dispensing with some other branches).

Second year.—Jacquard weaving. Practical work: Hand loom weaving—preparatory work for weaving, card cutting and binding, weaving on Jacquard looms with single harness and with lift shafts, with lowering healds, with damask appliances, looms for fancy weaving, etc., manufacturing lisérés, lancés, brochés, mexicaines, damasks, marquises, matelassés, and figured velvets; power loom weaving—preparatory work as above, weaving with single harness and with lift shafts on the various looms for manufacturing lisérés, lancés, damassés, figured gauzes, and smooth double backed velvets. Theoretical work: Lectures—on the origin of the raw silks, the properties, and the most judicious employment of the same in manufacturing, on floss silk, cotton, and wool, their manipulation, numbering, and their employment in mixing with silk, on establishing and managing a silk manufactory; instructions in preparatory work, in designing patterns for lisérés, lancés, brochés, mexicaines, damassés, marquises, matelassés, damasks, brocatels, lampas, figured velvets, and gauzes, in the mathematics of Jacquard weaving; theory of hand loom weaving—explanations of the work incidental to Jacquard hand loom weaving, preparatory work, transferring designs, card cutting and binding, the various contrivances, tools, and machines used in this work, and the preparation of the necessary drawings; theory of power loom weaving—description and explanation of the uses of the various kinds of power looms and auxiliary machines for Jacquard weaving, the preparation of cards, executing the necessary drawings, instructions in draughting machinery; free-hand and pattern

drawing—instructions in drawing from copy and from textiles, designing figured patterns for cravats and dress goods, styles of ornamentation (pupils desiring to become designers of Jacquard patterns can arrange to devote more time to drawing than others). Annual excursions are made to establishments where silk is manufactured, such as factories for twisting thread, dye-works, weaving mills, dressing and finishing rooms, silk drying works, machine shops, etc., for the purpose of giving the pupils an idea of the more practical work.

In order to give pupils the best opportunities possible for pursuing their studies an extensive library of technical works and a rich collection of old textiles have been bought for the school. These are at the disposal of the pupils every Saturday afternoon. The school possesses all necessary machinery and appliances, which are replaced or supplemented from time to time by the latest improvements. At present the school possesses 24 hand looms, of which 9 are Jacquards, and 18 power looms, of which 6 are Jacquards.

Following are the average number of hours per week devoted to each branch:

COURSE OF STUDY.

Subject.	First year.		Second year.	
	Winter.	Summer.	Winter.	Summer.
Practical work	12	18	12	15
Silk culture, history of silk industry, etc	1			
Drawing-in and piecing	8			
Preparing cards and study of materials		13	12	17
Mill bookkeeping, mathematics of weaving, study of colors, etc.		2		
Theory of hand loom weaving	2	3	4	4
Theory of power loom weaving	5	6	2	2
Technical drawing	4	4	2	2
Free-hand and pattern drawing	4	4	8	8
Styles, raw materials, manufacture, etc				2
Written exercises	8		4	
Total	44	50	44	50

The school is in session daily, except Sundays and holidays, from 8 a. m. in winter and 7 a. m. in summer until 6 p. m., with an intermission of two hours at noon. The school has a vacation of ten days at Christmas, one week at Easter, three weeks in July, and two weeks in October. Pupils have access to the school during vacation time for the purpose of doing practice work.

The instruction is conducted by the director who, besides being in charge, teaches the theoretical branches of raw materials, silk manufacture, and weaving; one teacher of practical and theoretical work relating to hand loom weaving; one teacher of practical and theoretical work relating to power loom weaving, and of technical drawing; one teacher of free-hand and pattern drawing, the preparation of cards for Jacquard looms, etc.

During the scholastic year ending October 1890 the attendance was 32 pupils in the first year's class and 13 pupils in the second year's

class. Of these only one was a foreigner. Since the school was founded it has been attended by 270 pupils.

Nearly all the graduates are employed in the various branches of the silk industry; some are proprietors or sons of proprietors of weaving establishments, some superintendents, overseers, or master weavers. Very few work as ordinary weavers. It is estimated that 95 per cent. of the graduates are still at occupations in the silk industry. No exact record is kept.

The school is under the administration of a commission composed of seven members, of which one is selected by the cantonal government, three are selected by the municipal government, and three by the Association of Silk Manufacturers of Zurich.

The income is derived from federal, cantonal, and municipal subsidies, tuitions, private donations, and from the treasury of the Association of Silk Manufacturers of Zurich. During the scholastic year ending October 1891 the income and expenditures of the school amounted to about 34,000 francs ($6,562).

The tuitions are as follows: Citizens of Switzerland, 200 francs ($38.60) for the first year, 300 francs ($57.90) for the second year; foreigners, 300 francs ($57.90) for the first year, 500 francs ($96.50) for the second year. Worthy persons without the necessary means may obtain free scholarships and compensation. Pupils may purchase the goods they weave for the cost price of the raw materials. The drawing and writing materials must be furnished by the pupils; all other supplies are provided by the school.

The requirements for candidates for admission are—a sufficient school education to make them capable of pursuing the studies required, a practical previous experience in weaving, and an age of at least 16 years. An examination in German composition, arithmetic, and weaving must be passed before the commission before pupils can be admitted. They must be competent to weave a simple piece of silk goods without flaws. The capacity of the school is for 32 first year and 16 second year pupils. If the applications exceed the vacancies preference is given to natives of Switzerland.

SCHOOL OF WEAVING, WATTWYL.

This school was established in May 1881. It is a private institution, founded and owned by the Cantonal Society for the Advancement of Public Utility (*Kantonale Gemeinnützige Gesellschaft*) of canton Saint Gall.

The object of the school is to produce able, practical master weavers, designers, and manufacturers of the various textiles, and to educate young men devoting themselves to the mercantile branches of the industry to a proper understanding of the materials and goods and the cost of producing and manner of calculating the same.

The course of study is for one year, and for those having experience in weaving it may be only six months. The work comprises all the details of a cotton or woollen weaving mill, weaving plain goods, coarse, fine, and complicated patterns, woollen plushes for slippers and upholstering, Turkish towelling, etc., on the hand and power looms, Jacquard looms, etc., performing the preparatory work on the looms, examining and finishing the goods, designing patterns and preparing cards from copy, from goods, and from original compositions. The technical work is arranged to come hand in hand with the practical, and includes technical drawing, study of materials, values, cost of production, and mathematics of weaving. Pupils are also taught in taking apart, putting together, and repairing looms and auxiliary machines. There are 6 power and 15 hand looms. A 9-horse power gas engine furnishes power for the looms and the electric light dynamo. A collection of works by the best artists is at the disposal of the pupils for consultation while designing patterns.

The school is in session daily from 8 a. m. to 5.30 p. m., with an intermission of one hour and a half at noon. The school is closed two weeks in May and two weeks in October, eight days at Christmas, and on Sundays and holidays. Classes are formed twice a year—in May and in October. The time devoted to theoretical and practical instruction varies with the work and with the previous knowledge of the pupil. On an average about one-half the time is devoted to each. One director and two assistants impart all the instruction.

The attendance at the close of the scholastic year ending April 9, 1891, was 36 pupils. Of these 6 were foreigners. During the ten years of its existence the school had up to April 1891, 263 pupils. The pupils are either sons of manufacturers and dealers in textiles, practical weavers who desire to perfect themselves and become master weavers, designers, superintendents, or other higher positions, or pupils direct from school. Those of the first two classes have as a rule sufficient experience to finish the course in six months. The last named remain one year, after which they become weavers and are advanced, generally in about three or four years, to higher positions. Very few of the pupils who have attended the school ever leave the textile industry. No record is kept of the present occupation of ex-students.

The affairs of the school are administered by a commission selected by the Cantonal Society for the Advancement of Public Utility. The income of the school is derived from state and federal subsidies, tuitions, private subscriptions, and from the treasury of the cantonal society. The expenses of the school amount in all to about 20,000 francs ($3,860) per year.

The tuition is 100 francs ($19.30) per year for citizens of Switzerland and 300 francs ($57.90) per year for foreigners. Free or partial scholarships are granted in the cases of persons with small means who are

considered worthy by the commission. All patterns, tools, and materials for instruction are furnished by the school.

Pupils must be at least 15 years of age, and must have completed the education required by law in order to be eligible. Their applications must be accompanied by certificates of diligence and good conduct from their last employers.

TRADE SCHOOL FOR LADIES' TAILORING AND NEEDLEWORK, ZURICH.

This school was founded in 1889. It is a private institution. Its object is to prepare young women for the professions of ladies' tailors, seamstresses, teachers of female manual training in the public schools, and to teach general needlework.

The school comprises three divisions, as follows: The division for ladies' tailoring; the division for plain sewing; the division for special courses in ladies' tailoring and needlework.

The ladies' tailoring division consists of a preparatory school (two years) and the trade school proper (one year). In the former instruction is given in hand and machine sewing, beginning with practical exercises in sewing, hemming, plaiting, and gathering, followed by the preparation of finished garments, etc., and this by elementary work in cutting and fitting; also free-hand and geometrical drawing, arithmetic, bookkeeping, and composition. In the trade school proper (third year), where pupils can enter only after having completed the two years of the preparatory school or served two years with a ladies' tailor, the instruction consists of preparing dress patterns, cutting, fitting, and finishing all kinds of garments, costumes, etc. Pupils are gradually advanced from very simple to the most difficult work.

The division for plain sewing consists also of a preparatory and a trade school, of one year each. In the former the work consists of sewing by hand and machine, beginning with practical exercises in all kinds of sewing, hemming, plaiting, gathering, etc., and followed by finishing garments, such as ladies' chemises, etc.; the instruction also includes free-hand and geometrical drawing, arithmetic, bookkeeping, and composition. In the trade school proper (second year), where pupils can enter only after having passed through the preparatory school or possessing the proficiency attained there, the course is as follows: Cutting of all kinds of linens and underwear, drawing patterns according to measure and directions, sewing and finishing the garments and other articles. Pupils begin with simple pieces and gradually advance until they are capable of making all kinds of linens, etc.

After finishing either one of the two principal courses of study pupils may enter the workshops of the school, where goods are made for customers and where a better practical experience can be had. Instruction there is gratuitous.

The special courses are as follows:

Ladies' tailoring—course in cutting for ladies' tailors, six weeks, six hours instruction daily, 30 francs ($5.79); course in dressmaking and cutting, for housewives and daughters, three months, six hours daily, 50 francs ($9.65), sewing machine 5 francs (97 cents) extra; evening course in cutting and pattern drawing for plain garments, six months, three evenings per week from 7 to 9 p. m., 25 francs ($4.83).

Linens—plain sewing by hand and machine, six months, three evenings per month, 6 to 8 p. m., 1 franc (19 cents) per month; cutting linens for home use, four to five months, six hours daily, 50 francs ($9.65), sewing machine 5 francs (97 cents) extra; cutting gentlemen's linens and underwear, four weeks, four hours daily, 30 francs ($5.79); cutting and finishing gentlemen's linens and underwear, four weeks, eight hours daily, 40 francs ($7.72).

Course for teachers of manual training in the public schools, six months, daily, full time, 80 francs ($15.44).

The school is in session daily except Sundays and holidays, and four weeks' vacation in summer. For the regular pupils the hours of work are from 7.30 a. m. in summer and 8 a. m. in winter until 6 p. m., and Saturdays until 4 p. m., with an intermission of two and one-half hours at noon. The time devoted to theoretical and practical work varies with the pupils and the nature of the work on hand and can not be specified.

The teaching personnel consists of one teacher for the regular course in ladies' tailoring, one teacher for the special courses, one teacher of plain sewing, and three teachers for the theoretical branches. The last three devote only a portion of their time to the school.

The following table shows the attendance during the scholastic year ending April 1891:

	Pupils.
Preparatory school for ladies' tailoring	9
Trade school for ladies' tailoring	5
Preparatory school for plain sewing (linens and underwear)	7
Trade school for plain sewing (linens and underwear)	12
Two special courses for ladies' tailoring (cutting)	26
Three special courses in dressmaking and cutting for housewives, etc	34
One special course (evening) in cutting and pattern drawing	14
One evening course in plain sewing (linens, etc.)	12
One special day course in cutting (linens, etc.)	4
One special day course in plain sewing (linens, etc.)	12
Employed in workshops (regular)	5
Total, regular pupils	38
Total, special course pupils	102
Total attendance	140

No record is kept of the pupils after they leave the school. Of the eighteen who had graduated three were known to be employed at the occupations for which they had studied; two had become teachers of manual training for girls in the public schools; the rest could not be

located. No information whatever could be obtained regarding occupations of pupils of the special classes. The total attendance since the establishment of the school up to April 1891 was 200.

The affairs of the school are administered by a committee of ten members who represent the various communities, societies, and state government that contribute to the support of the same. A board of five directors, of whom two are women, has immediate control over the conduct of the school. This board is elected by the committee of representatives.

The expenses of the school are met by contributions from societies for the advancement of public utility, from various communities and private individuals, by subsidies from the cantonal and the federal government, by tuitions, by sale of work, and by the income from the capital. During the year 1890 the income and expenditures were as follows:

INCOME.

Contributions and subsidies	$2,171.25
Income on capital	97.03
Tuitions	746.91
Sale of school supplies to pupils	268.64
Proceeds from the sale of work	1,228.91
Total	4,512.74

EXPENDITURES.

Rent, heating, lighting, and service	954.38
Salaries of teachers	1,507.54
Furniture	403.14
School supplies	241.51
Materials for practical work	1,064.37
Library	19.46
Advertisements, printing, stationery, etc	335.04
Total	4,525.44

Young women who sign a contract of apprenticeship for the full term of three years in the division for ladies' tailoring pay an admission fee of 5 francs (97 cents), and obtain the instruction gratuitously. Those not signing the contract pay 50 francs ($9.65) per year during the first two years, and obtain the third year's instruction gratuitously. Pupils who have been prepared elsewhere and enter the third year's class pay 80 francs ($15.44) for the year. Pupils signing the contract of apprenticeship in the division for plain sewing pay an admission fee of 15 francs ($2.90), and nothing more. Others pay, in addition, 35 francs ($6.76) for the first year. Those prepared elsewhere, and entering the second year's class, pay 80 francs ($15.44) for the year; others pay 50 francs ($9.65). The fees and tuitions for the special courses have been indicated in the programme. In any of the classes the tuition may be entirely or partially remitted in the cases of persons without means who are considered worthy. These may also in time receive stipends, for which purpose a specially donated fund exists.

Pupils must be at least 16 years of age to enter either of the two trade divisions. To enter the preparatory class in ladies' tailoring they must be 14 years of age and in the case of the plain sewing preparatory class they must be 15 years of age. They must have an education equal to that required for graduates from the second year of the higher primary schools (a total school attendance of eight years). Materials, utensils, and school supplies are furnished by the pupils. Sewing machines are furnished gratuitously, except where otherwise indicated. All regular pupils are placed on about two months' probation.

At the close of each scholastic year examinations take place and an exhibition of work. On the basis of these results certificates of graduation are issued. Pupils from the preparatory classes and others can enter the trade schools proper only after having passed a satisfactory examination. At the end of each quarter pupils obtain reports concerning deportment, scholarship, and results accomplished.

TRADE SCHOOL FOR WOMEN, BERN.

This school was founded May 1888 as a private institution. It aims to educate women of all stations in life by practical and theoretical instruction in such needlework as is necessary in an ordinary household, or for the occupations of seamstress and ladies' tailor.

The course of instruction comprises the three principal branches—plain sewing, ladies' tailoring, and embroidery work; and special classes in ironing, cooking and housekeeping, mending, and making children's garments. The first three require three and one-half months each, the latter a much shorter time. For the principal branches drawing is included and is compulsory. Instruction in plain sewing comprises—hand and machine work; the different kinds of stitches; cutting and finishing linens for children, women, and men; mending and darning different kinds of goods; handling the sewing machine; pattern drawing; free-hand drawing, for educating the eye and the taste of the pupil, and to serve as a foundation for pattern drawing. The ladies' tailoring branch comprises—taking the measure; cutting and fitting; sewing and trimming dresses for ladies and girls; making all kinds of women's garments according to fashion plates; altering dresses; pattern and free-hand drawing. The embroidery work comprises—all kinds of white and colored embroidery on linen, cloth, silk, and velvet; transferring drawings on the goods to be embroidered; free-hand drawing. The courses in cooking last six days each, and comprise the manner of arranging meals so as to be wholesome and palatable. At the beginning of each class the teacher prepares a bill of fare for the whole course. The dinner (at noon) consists of one kind of soup, one kind of meat, one kind of farinaceous food, and one kind of vegetable. These are prepared in all the different ways customary in a good Swiss household. The supper consists of soup or coffee with milk and one kind of meat or other article of food. Attention is also given to warm-

ing up and rearranging the remnants of a previous meal. From 9 to 10 a. m. theoretical instruction is given, that is explanations of the manner of preparing meals from text books on cooking From 2 to 4 p. m. notes are made by pupils of special points of importance in the household duties, and instruction given in household bookkeeping.

The school is in session daily except Sundays and holidays. During the year ending December 1890 there were three courses each in the following branches: Plain sewing, ladies' tailoring, embroidery, mending, ironing, making children's clothing, and cooking. Each of the courses in plain sewing, ladies' tailoring, and embroidery covered three and one-half months, classes being in session seven hours daily, except on Wednesdays and Saturdays when there were only three hours' work; three hours per week were devoted to drawing. The classes in ironing were each at work three and one-half hours every Wednesday and Saturday afternoon during fourteen weeks. Classes in mending and in making children's clothing were each in session twenty hours per week for four weeks. The classes in cooking were each at work from 9 a. m. to noon and from 2 to 6 p. m. during one week.

The teaching force consists of one teacher for the classes in plain sewing, mending, and embroidery, one for the class in ladies' tailoring, one for the class in ironing, one for the cooking classes, and one for drawing; these are all females.

The attendance of the school has been as follows during the years of its existence:

ATTENDANCE OF PUPILS.

Class.	1888.	1889.	1890.
Plain sewing	18	31	23
Ladies' tailoring	14	44	34
Embroidery	.....	2	2
Ironing	.....	21	10
Mending	.....	.....	21
Children's garments	.....	.....	2
Cooking	.....	20	27

No record is kept of the occupations of former pupils and no information could be obtained. Most of them attended simply to perfect themselves in their household work and to make articles and wearing apparel used in the family. Some of them are dressmakers and seamstresses who work at home or go out by the day. Very few are said to be employés in establishments.

The affairs of the school are conducted by a commission of three gentlemen and two ladies selected from among the members of the society which controls the school. The chairman of this committee is the director of the school. This commission has entire control of the interior arrangement of the school, determines the rates of tuition, arranges the courses of study, represents the school in all business transactions, and recommends the salaries of teachers and their appointment or dismissal. A ladies' committee of five members is appointed

for consultation in matters of a technical nature. The society has a membership of 232 persons of both sexes resident in the city of Bern.

The expenses of the school are met by subsidies from the city of Bern, the canton of Bern, and the federal government, by tuitions, by interest on capital, and when necessary by drawing on the reserve fund. During the year 1890 the income and expenditures were as follows:

INCOME.

Subsidy from the city government	$289.50
Subsidy from the state government	115.80
Subsidy from the federal government	173.70
Tuitions	430.10
Interest on capital	14.04
Drawn from reserve fund	41.95
Total	1,065.09

EXPENDITURES.

Salaries of teachers	778.50
Rent, light, heat, and janitor's services	138.90
Furniture, school supplies, fashion plates, etc	60.23
Printing and advertising	81.46
Repairs, special expenses for sundries	6.00
Total	1,065.09

During the same period the income and expenditures of the cooking school were as follows:

INCOME.

City contribution	$38.60
Bernese Society for the Advancement of Public Utility	30.56
Total	69.16

EXPENDITURES.

Purchase of articles of food	19.56
Advertisements, kitchen utensils, text books, etc	18.72
Compensation of special instructors	30.88
Total	69.16

The tuition was—for dressmaking, 40 francs ($7.72), for plain sewing, 30 francs ($5.79), and for embroidery, 20 francs ($3.86), for the course of three and a half months; this included lessons in drawing. For former pupils who wished to reënter, 4 francs (77 cents) per week. For the special courses the tuition was 15 francs ($2.90) for ironing, 15 francs ($2.90) per week for making children's clothing, and 5 francs (97 cents) per week for course in mending. The instruction in cooking and housekeeping was given gratuitously. In cases where persons have not sufficient means to pay tuition it may be partially or entirely remitted in any of the classes. The materials and sewing machines must be furnished by the pupils. All finished products belong to the pupils

making them, but they can not be removed until the close of the course of study.

Persons desiring to attend the school must be at least 15 years of age, and must have some previous training in needlework. They must be of good moral character. Pupils for the cooking school are selected by the public school authorities from among the poorest people; they must bind themselves to attend regularly the entire course.

At the end of each course public exhibitions are made of the drawings and work done, and pupils obtain certificates of proficiency, scholarship, and deportment. In the cooking school each pupil is examined on the last day.

TRADE SCHOOL FOR WOMEN, BASEL.

This school was founded August 18, 1879. It is owned by the Society for the Advancement of Public Utility of Basel. Its object is to educate women of all stations in life in such work as pertains to their sex, and to place them in a position to perform such work independently.

The instruction comprises the following courses: Plain sewing, and the pattern drawing, darning, and mending pertaining thereto; machine sewing, preparing all kinds of linens, such as underclothing, men's shirts, infants' clothes, etc., and the pattern drawing and mending pertaining thereto; dressmaking and pattern drawing; white embroidery; artistic embroidery in colors; worsted work, such as network, crocheting, knitting, and other fancy work; mending and darning; ironing; millinery; drawing; arithmetic and bookkeeping; special class in methods of instruction for teachers of needlework.

Instruction in plain sewing comprises the different kinds of stitches; their application to articles from the simplest to the most difficult, such as bed and table linens, and different kinds of linen garments; cutting and drawing patterns for these kinds of articles; taking measures and preparing garments according to dictated specifications; cutting and finishing the same independently; mending by inserting pieces by means of different kinds of stitches; darning on various kinds of goods in imitation of the material.

Instruction in machine sewing comprises a study of the construction of the sewing machine; adjusting and cleaning the same; practice in ordinary sewing, straight lines, narrow borders, then gradually by means of the various attachments; the sewing of table and bed linens and garments (particular attention is given to men's shirts and the insertion of various styles of bosoms); taking measures and mending as in plain sewing; pattern drawing, especially of more difficult linens.

The instruction in ladies' tailoring comprises, in succession, all the different styles of dresses and other garments, and their execution from measure. The pupils must learn to draw and cut the patterns without assistance.

Instruction in embroidery comprises instruction in the preparatory work; transferring the drawings on the goods; gradual practice in all

kinds of white and colored embroidery. The classes in white and colored embroidery are separate.

Instruction in worsted work includes all styles of knitting, crocheting, network, fringe work, and work on frames. Work is done principally from patterns, either in the shape of drawings or worsted work.

Instruction in mending and darning comprises mending practice pieces, garments, and linens. Darning consists first of simple cross-stitching, later of imitating damasks, etc. Darning by means of the lace stitches or meshes is practised first on cards, later on goods. This work is so perfectly done that when a piece of work is finished it is difficult to find the patches or to distinguish the darned work from the rest of the goods.

Ironing is done first on ladies' chemises, etc., then on starched linens, such as collars, cuffs, men's shirts, chemisettes, lace curtains, and women's dresses.

Millinery work begins with folding and quilling, tying bows, etc., then trimming of hats.

Instruction in drawing comprises handling the T-square, the triangle, the compasses, and the construction of regular figures; later, elements of free-hand drawing; straight and curved line ornaments; flowers, leaves, vines, etc.; elements of ornamentation, methods of ornamentation, entwining, drawing and transferring ornaments for embroidery, etc.; straight and curved line ornamentation with braid and lace; colors and coloring effects; designing original patterns for embroidery, etc.

Arithmetic and bookkeeping instruction comprises keeping business accounts, study of exchange, and such other branches as are required in a mercantile business.

The course of instruction for teachers of needlework comprises one whole year's work. Beginning with simple meshes and stitches it gradually extends over all branches of needlework such as are taught in the public primary and high schools.

The school is in session all the year except a few weeks' vacation in summer and on Sundays and holidays. The course of instruction in each branch is about 4 months. Instruction in the principal branches, plain sewing, machine sewing, and ladies' tailoring, is given from 8 a. m. to noon and from 2 to 5 p. m.; Wednesday and Saturday afternoons are free. For the special courses of embroidery, white and in colors, there are twelve hours' weekly instruction; for worsted work, mending and darning also twelve hours; for millinery, one afternoon of four hours; for arithmetic and bookkeeping, two afternoons of two hours each or four hours; for ironing, one afternoon of four hours. The class for teachers of needlework is in session two afternoons of one hour each per week. Drawing, four hours per week; this in the case of the three principal courses is compulsory.

The teaching personnel consists of a director who has supervision over the entire school, but has no class. He at times delivers lectures.

His services are rendered gratuitously. There is one teacher each for the courses in plain sewing, machine sewing, ladies' tailoring, embroidery, worsted work, mending and darning, ironing, and millinery; and one teacher of arithmetic and bookkeeping. Instruction in drawing is given by the teachers of other branches. This with the director makes ten instructors in all. All of these, except the three for the principal courses, devote only a portion of their time to the school.

The attendance at the institution during the year ending December 1890 was as follows:

ATTENDANCE OF PUPILS.

Class.	December to April.	April to August.	August to December.	Total.
Plain sewing	18	22	15	55
Machine sewing	30	26	23	85
Dressmaking	26	23	29	78
Embroidery in white	13	13	12	38
Embroidery in colors	10	7	11	28
Mending (including pupils of cooking school)	34	33	48	115
Worsted work	13	16	16	45
Millinery	14	19	12	45
Ironing (including pupils of cooking school)	45	52	43	140
Bookkeeping (including pupils of cooking school)	22	20	28	70
Needlework, for teachers				11
Total				710

The present occupation of former pupils is not known, as no record is kept of such information. A large majority of them have attended in order to be useful at home; some take in sewing and some work as seamstresses by the day; some are established in business, others are working as employés in the lines for which they studied; over 40 are known to be teaching needlework in public and private schools in Switzerland and foreign countries. In ten years the yearly attendance has increased from 72 to 710 pupils, with the applications for admission greatly exceeding the capacity of the school. The number of pupils who have attended the school since its establishment amounts to about 2,400.

This institution is under the supervision and direction of a commission elected by the Society for the Advancement of Public Utility. This committee has charge of the organization of the school and the preparation of the courses of instruction, appoints and dismisses the teachers, regulates their pay and duties, and, in connection with the ladies' committee of the society, has direct supervision over the interior workings of the school.

The expenses of the school are met by national subsidies, by regular contributions of the society, by tuitions, and by private contributions. Following are the income and expenditures for the year 1890:

INCOME.

Balance from last year	$113.13
Contributions from the society	579.00
Federal subsidy	579.00

ntions	193.00
ıt of money paid for rent	116.07
	2,102.93
	3,683.13

EXPENDITURES.

achers	2,075.33
ıayments on borrowed capital	663.92
l repairs	220.31
ater, and janitor's services	402.27
isements, journals, etc	76.80
	122.16
	3,560.79
on hand	122.34

ons for attendance are as follows:

ıin and machine sewing, each	$5.79
ssmaking	7.72
ıite and colored embroidery, each	4.83
ırsted work and mending, each	3.86
e	2.32
llinery, arithmetic, and bookkeeping, each	1.93
ıchers of needlework	1.93

three principal courses instruction in drawing is included. upils pay 5 francs (97 cents) per week for drawing.

ıany cases the tuition is partially, and in some cases entirely, hen it is found that applicants can not afford to pay the e. The materials and the sewing machines must be furhe pupils using them. The teachers indicate the work to t the articles made belong to the pupils. These can not be ıtil the end of the course.

pupils must be at least 15 years of age and must have some ıowledge of needlework. They can enter only at the com- of a course, in April, August, or December. When the apxceed the vacancies the commission decides upon the accept- most eligible. Pupils upon entering bind themselves to entire course chosen.

ıd of every course each regular pupil obtains a certificate , diligence, attendance, and deportment. Pupils who disemselves through diligence, deportment, and good progfter having attended the three principal courses and one se in embroidery or worsted, obtain a graduating diploma.

for cooking and housekeeping was founded in 1889 as a the trade school. The object of the school is to educate en in the duties of thorough housewives by means of pracıg and systematic scientific instruction.

uction comprises cooking, washing, ironing, mending, darnsing and preserving foods of all kinds, arranging, heating,

and lighting rooms, household bookkeeping, study of the nutritive properties of food and preparing meals in accordance therewith, and instructions in hygiene and nursing. Careful attention is given to training young women in promptness, cleanliness, order, and thrift.

The courses of study begin in December, April, and August, each continuing about four months. The school is in session from 8 a. m. to 8 p. m. daily except Sundays and holidays. Dinner is served at noon, bread and coffee at 4 p. m., and a simple supper at 7 p. m. The time not employed in kitchen and household work is spent in the class rooms for ironing, mending (not including artistic mending), and bookkeeping of the trade school, this instruction being included without extra charge.

One matron is in charge of the cooking and household work. A physician delivers lectures on nursing and bandaging, the latter with practical illustrations. Other branches are taught in the trade school, as stated. The director of the trade school is also director of the cooking school. The attendance during 1890 was 12 pupils each for the first and second courses and 24 pupils for the third course, making for the year 48 pupils. Since the foundation there were in all 62 pupils. These pupils attended in order to become more proficient at home and not to make cooking a profession. A few became servants.

The administration is the same as that of the trade school. The income of this school is derived from national subsidies, regular contributions of the society, tuitions, and sale of dinners and coffee to outsiders. During the year 1890 the income and expenditures were as follows:

INCOME.

Balance from last year	$71.54
Contributions of the society	386.00
Federal subsidy	193.00
Tuitions	353.19
Dinners and coffee served to outsiders	133.00
Sundry receipts	26.82
Total	1,163.55

EXPENDITURES.

Salaries of teachers	542.91
Meat	152.58
Bread	35.31
Groceries, etc	79.47
Milk, butter, cheese, vegetables, eggs, etc	208.14
Sundries	16.92
Fuel (wood, coal, and gas)	63.93
Stationery, etc	9.65
Advertisements	10.05
Interest on borrowed capital	37.63
Total	1,156.59
Balance on hand	6.96

The tuition is 20 francs ($3.86) per month. This includes the meals (dinner, supper, and 4 o'clock coffee) and class instruction in mending, darning, ironing, and bookkeeping. For the class instruction in needlework and ironing pupils must furnish their own materials, and articles when finished remain their property.

Pupils must be at least 15 years of age. The commission makes the selections when the applications exceed the vacancies. Upon entering the pupils bind themselves to perform all the duties required of them, and to be obedient, industrious, and of good behavior. An examination takes place at the end of each course. Pupils obtain certificates of diligence, deportment, and proficiency.

The school aims, above all things, to make good housewives, hence the addition of other branches such as mending, ironing, and lectures on hygiene and nursing. Not much attention is given to fancy cooking, the idea being mainly to teach pupils how to arrange the meals and bills of fare in order to have the food wholesome and nourishing. The pupils must also estimate the cost of every article and learn how to provide a substantial meal for a given number of persons at a given price. A comparison of the weight of pupils attending the school, made before and after their sojourn (four months), showed an average gain in weight of 2½ pounds per pupil. During this period the dinner, 4 o'clock coffee and bread, and supper cost, on an average, 47½ centimes (9½ cents) per head per day. This included food and fuel expenses.

SCHOOL FOR SERVANTS, BERN.

This school was founded May 1891 by the Women's Society for the Advancement of Public Utility of canton Bern. It is a private institution. All pupils board at the school.

The object is to give to young women desiring to become servants the advantages of a training in the duties required in a city household, and to supply the rapidly increasing demand for good, competent servant girls. Young women coming from farms and villages to enter into service in city families generally have not the slightest conception of the proper arrangement of the work in the household, are very awkward in their demeanor toward visitors, in serving at the table, etc., and are often untidy in regard to their own person. The school aims to correct such faults and to give the young women the necessary training and polish. Persons requiring servants can not always find such as are recommended for honesty, or are known to come from upright parents. At the school great care is taken in the selection of pupils, and during their attendance at the school opportunity is had of testing their qualities for honesty and diligence. As a consequence people obtaining servants from this school generally know what they are getting.

As this is to some extent a philanthropic institution the course of study, or rather time of attendance, must be made as short as possible

so as not to keep the young women too long from gaining a livelihood. It is considered that three months are sufficient to remove the objections which exist respecting country girls as servants.

The following regulations of the school give a fair idea of the work done and system of training adopted:

Kitchen duties.—Pupils detailed for kitchen work will appear in the kitchen at 6 a. m. in summer and 6.30 a. m. in winter; kindle the fires, prepare the breakfast, and blacken all the shoes; carry fuel, wash up and clean the kitchen, cook and prepare the dinner, wash the dishes, clean the range, and put the kitchen in order; prepare supper, wash up and clean the kitchen.

Household duties.—Pupils detailed for household work will air the dining room, set the table, sweep, and dust the furniture; make the beds empty the water, and put the bedrooms in order; sweep the halls and stair case; clean and fill the lamps; carry water and wood; wash all soiled linens; set the table at noon and remove the dishes afterward; make purchases and do other errands; arrange the bedrooms in the evening; set the table for supper and afterward remove the dishes.

Instruction and lectures are given by the matron and by the pastor of one of the churches in deportment, politeness, hygiene, and ethical culture. The cooking consists of the simple preparation of the different kinds of foods, meats, farinaceous foods, vegetables, stewing and preserving fruit, etc. Instruction is given in mending garments, knitting, darning, etc., washing, ironing, and, in general, all the details of housework.

The following order of work is strictly enforced: Pupils must arise at 5 a. m. in summer and at 6 a. m. in winter; the beds must be made, the rooms arranged and aired; breakfast is prepared and served at 6 a. m. in summer and 6.30 a. m. in winter; distribution of the work equally among the pupils; a slice of bread for each pupil at 9 a. m; dinner served at noon, consisting of soup, one kind of meat, and vegetables; on Mondays and Fridays farinaceous foods and fruit take the place of meat; the school and sitting rooms must be aired and cleaned, the dishes washed, the kitchen put in order, and other services performed; a slice of bread for each pupil at 4 p. m.; in winter and on Sundays in summer coffee is served with the bread; supper at 6 p. m., consisting of coffee, cold dishes, or what remains of the midday meal; after the dishes have been washed and the kitchen and rooms put in order the pupils will occupy themselves with sewing, knitting, etc., under the instruction and guidance of the matron; from 9 to 10 p. m. pupils will be at liberty; at 10 p. m. all lights must be put out; pupils must at all times observe strict obedience to the matron; proper behavior, order, cleanliness, attention to duty and truthfulness are required of each pupil; on Sundays pupils who are not detailed for kitchen work are required to attend church services; Sunday afternoons pupils may make calls or take promenades, if permitted by the matron; they must

return before 6 p. m.; they may occupy themselves with reading, letter writing, or conversation if they do not go out; all requests or complaints must be made to the matron, who will take the proper action or give the necessary advice.

A matron is in charge of all the instruction. Lectures on hygiene are at times given by a physician and on deportment and ethics by a minister of the gospel. The two latter receive no compensation. The matron receives 500 francs ($96.50) per year and board and lodging.

The attendance is 12 pupils, which is the full capacity of the school. Twelve pupils had already finished their course and were in positions when the school was visited (November 1891). The attendance is limited to 12 pupils because it is considered that the matron could not give enough attention to each individual if the number were greater.

The girls who have graduated obtained positions at once. The applications for them have been, so far, for three times as many as could be supplied. The matron can, therefore, be careful to place the girls in families where they will be kindly treated. If girls lose their positions through no fault of their own they can reënter the school and board there at a very small expense until they obtain other positions. This has not yet happened.

A committee of ladies (members of the society which owns the school and who reside in Bern) has complete control over the affairs of the school, appoints the matron, fixes the tuition and other conditions of admittance, etc.

The income is derived from fees for tuition and board which, in many cases, are paid by charitable societies or individuals; by renting furnished rooms with board, the work necessary for this being done by the pupils; by hiring out more advanced pupils for service, by the hour or day, in the families of members of the society. For this service a charge is made of 10 centimes (2 cents) per hour, or 70 centimes (13½ cents) per day. In nearly every case the girls, upon graduating, have entered families where they had previously worked in this way; the city of Bern has contributed 500 francs ($96.50) toward furnishing the school; all deficits are paid out of the treasury of the Women's Cantonal Society for the Advancement of Public Utility. The tuition and board amount to 60 francs ($11.58) for the entire course of three months.

Each girl desiring admittance must furnish the official certificate of birth, and a certificate of good conduct and morality from the authorities of the town or district in which she lives. She must be at least 15 years of age, but girls a little older obtain preference.

The school when visited was a model of order and cleanliness. The bedrooms, kitchen, dining and sitting rooms were well aired, clean, and tidy. Every piece of furniture was properly placed and not a speck of dust was noticeable anywhere. The young women were polite, plainly but neatly dressed, and all had a cheerful, healthy appearance. The school was visited at an unexpected time.

Applications for admission greatly exceed the capacity of the school, and, although it had existed only six months, its usefulness was so apparent that the subject of founding several more was under consideration by the society.

SCHOOL OF ART AND NEEDLEWORK, ZURICH.

This school was founded in 1880. It is a private institution. Its object is to thoroughly educate young ladies in the various useful branches of woman's work, in order to fit them for housewives, for industrial pursuits, or for teachers of manual training of girls.

The instruction is divided into three principal branches—the industrial, the artistic, and the scientific and literary.

The industrial branches comprise the following courses: Hand sewing—practice in the different kinds of stitches, mending and darning on different kinds of goods, cutting and finishing all kinds of linens and underclothing, theory of pattern drawing; machine sewing—cutting and finishing linens and underclothing, instruction in handling and adjusting the sewing machine and use of the various attachments, theory of pattern drawing; dressmaking—latest methods of taking measurements and cutting, sewing, and trimming all varieties of garments for ladies and children, preparing garments according to fashion plates, altering clothes, pattern drawing; embroidery—various kinds of white, colored, and gold embroidery on cloth, silk, velvet, linen, etc., special drawing and painting (reproduction on different materials), study of styles and of color; worsted work—knitting, crocheting, network, tying, and working on frames, free-hand drawing; millinery; ironing; cooking and housekeeping.

The artistic branch comprises—general instruction in free-hand and geometrical drawing, and perspective. Special instruction is given in drawing and painting from nature and painting on wood, silk, leather, porcelain, etc., and science of colors.

The scientific branches comprise the following: Bookkeeping, arithmetic, and correspondence; languages—German, French, Italian, and English. Classes for physical culture and dancing are given during the winter term, as well as lectures on hygiene. Lectures on general and special subjects are given at intervals without extra charge.

Several pianos are also at the disposal of pupils who take lessons at the conservatory of music. Each branch requires three months, and the pupils or parents have the choice of the same. Only one of the principal industrial branches can be taken at a time, but one or more of the secondary branches may be taken in connection with it. Pupils may, however, take portions of the work required in the principal branches as secondary branches, or they may take only secondary branches if they desire. Lessons in gardening are given at times in season.

The school is in session daily, except Sundays and holidays, from 8

to 11 a. m. and 2 to 6 p. m. in summer, and from 8 a. m. to 12 m. and 2 to 5 p. m. in winter. A vacation of from eight to twelve days is given at the end of every three months.

The faculty consists of the director, three teachers of needlework, three of languages, two of drawing and painting, one of music, one of bookkeeping, arithmetic, and correspondence, one of ironing, and one of cooking. These are all specialists.

The attendance of the school during the first ten years of its existence was as follows: Hand sewing and mending, 303 pupils; machine sewing, 643; dressmaking, 483; embroidery, 286; worsted work, 236; millinery, 88; ironing, 156; drawing and painting, 151; bookkeeping, 116; French language, 297; English, 126; Italian, 105; German, 116; housekeeping and cooking, 59. As each course is of only three months' duration, and as several branches may be taken simultaneously, the same pupil may appear a number of times in the above figures. There were 1,144 different persons in attendance altogether during the ten years. Of these 69 were foreigners, 8 being American residents.

The pupils who attend this school are generally the daughters of the wealthier people who look upon this education as a sort of finishing off before leaving school entirely. Their object is to become what is considered the ideal housewife in Switzerland, that is, women who possess not only a fair school education in science, literature, etc., but who can also manage or perform the duties of a household and beautify a home. Very few graduates attend in order to earn a livelihood as employés. Some attended to learn the duties of teachers in industrial schools and are now in such positions.

The administration of the school is entirely in the hands of the director. The school is supported entirely by tuition fees.

The tuition per term of three months is as follows: Sewing by hand, etc., three and one-half days practical work and one day pattern drawing per week, 30 francs ($5.79); machine sewing, three and one-half days practical work and one day pattern drawing per week, 30 francs ($5.79); cutting only, one-half day per week, 15 francs ($2.90); dressmaking (including cutting), three and one-half days practical work, one day pattern drawing, 45 francs ($8.69); embroidery, three and one-half days practical work, one and one-half days drawing, 30 francs ($5.79); worsted work, three and one-half days practical work, one-half day drawing, 30 francs ($5.79); artistic branches, 20 francs ($3.86); millinery, one-half day per week, 10 francs ($1.93); ironing, one-half day per week, 10 francs ($1.93); bookkeeping, arithmetic, and correspondence, 4 hours per week, 20 francs ($3.86); languages, each 20 francs ($3.86); lectures on hygiene, 10 francs ($1.93). Pupils taking one of the first six principal branches obtain lessons in languages at half price. When two or more members of the same family attend simultaneously a reduction of 10 per cent. is made in their tuitions. A limited number of pupils are taken as boarders at the school. These pay 200 francs ($38.60)

for three months, exclusive of tuition. A dinner at 1 franc (19 cents) per head per day is furnished to others who desire it. The course in cooking can be taken on four half days per week for three months or, in connection with other branches, daily for six weeks. The tuition (exclusive of meals) is 20 francs ($3.86) per term, but only those taking board or one meal per day can enter the cooking class.

Pupils to be admitted must be at least 14 years of age. Special classes in needlework and drawing are given one-half day per week to younger persons. Pupils can so arrange their work as to be occupied at the school during the entire day, in which case they can finish all the branches in about one to one and a half years. Most pupils, however, take lessons only by the term of three months. Unavoidable absence of one week or more can be made up. The materials and sewing machines are furnished by the pupils, and all finished articles belong to them. Sewing machines can be rented at 4 francs (77 cents) per month.

Pupils obtain, at the end of each term, certificates of diligence, progress, attendance, and deportment. Pupils who have finished the terms in at least three branches, and who are thoroughly proficient and have been exemplary in deportment, obtain graduating diplomas. Special diplomas are issued to persons desiring to become teachers of needlework, provided they deserve them.

This is the only female industrial school in Switzerland which includes in its programme the instruction in all branches—industrial, artistic, and scientific—which is most necessary for a refined housewife. It is recognized in Switzerland as the model school for giving the finishing touches to the education of young ladies before they assume the responsibilities of housewives. A gold medal was awarded to this institution at the international exposition at Paris in 1889.

SCHOOL FOR SERVANTS, LENZBURG.

This school was founded October 1889 by the Women's Society for the Advancement of Public Utility of canton Aargau. It is a private institution. All pupils board at the school.

The object of the school is a twofold one—to offer to poor girls desiring to become servants the advantages of a training in all household duties and to supply the steadily increasing demand for good, competent servants.

The course of instruction is for three months. The pupils perform all the household duties required in the establishment. They alternate in their duties in the kitchen or the household work. In season garden culture is also attended to. The time not required for housework is spent in needlework, such as plain sewing, mending, darning, and knitting. Washing and ironing are also included. The regulations of this school, as well as the working hours, are precisely the same as those of the school for servants at Bern, the latter school being modelled after this. The following, copied from the daily journal kept at

the school, will give an idea of the nature and cost of the meals furnished to pupils:

July 1, 1891.—Dinner—rice soup, Brussels sprouts, cutlets; supper—coffee, strawberry tarts; second dinner—meat soup, boiled beef, turnip sauce; supper—coffee, mashed potatoes, pot cheese; third dinner—coffee, cutlets; supper—oatmeal porridge; fourth dinner—oatmeal soup, liver cutlets, beans; supper—coffee, fried potatoes; fifth dinner—rice soup, roast pork, potatoes, lettuce; supper—coffee, butter, jam; sixth dinner—farinaceous soup, mashed potatoes, lettuce; supper—coffee, boiled rice; seventh dinner—oatmeal soup, ragout, sugar pease, turnips; supper—coffee, potatoes.

By careful and economical arrangement of the victuals, which is the principal feature of the cooking, the average cost per head per day of the above meals was 43 centimes (8⅓ cents). During the month of July, 1891, 577 daily rations (breakfast of bread and coffee, dinner and supper as above) cost in all 248.70 francs ($48.00). Nearly all vegetables are raised by the pupils. Attention is also given to the preserving of vegetables and fruit, to baking different kinds of bread, cakes, and cookies. Meals, cakes, bread, and needlework are also prepared for customers. Pupils are also detailed for work in the families of members of the society for more practical instruction. Families obtaining such help pay a small compensation to the school. Pupils also have lectures on deportment, hygiene, cleanliness, etc. The instruction and training are conducted by a matron.

The attendance of the school when visited was 12 pupils, the full capacity. Up to May 1891, 80 girls had attended the course, nearly all of whom entered service as domestics immediately upon leaving. A few returned to their homes. Pupils at once obtain positions when they have finished the course.

A committee of members of the society resident in Lenzburg and Aarau has complete control over the affairs of the school and makes all purchases of furniture, etc., and other arrangements.

The income is derived from tuition and board of pupils, the renting of furnished rooms and board, sale of needlework, meals, bread, cakes, etc., town and private contributions, society funds, etc. The income and expenditures of the school in 1891 were as follows:

INCOME.

Tuition and board of pupils	$472.85
Sale of vegetables	5.79
Needlework, sale of	84.92
Work done by pupils in families	46.32
Sale of bread, cakes, etc	38.60
Contributions of the society for rent	115.80
Boarders in summer	115.80
Other contributions	17.37
Sale of dinners	28.95
Total	926.40

EXPENDITURES.

Rent of building	$115.80
Salary of matron	115.80
Meals, fuel, etc.	694.80
Total	926.40

The tuition, including board, is 60 francs ($11.58) for three months. Of this, 10 francs ($1.93) are returned to the pupils when they enter into service as domestics. During 1891, of 48 pupils who attended, 8 pupils had entirely free scholarships and 6 pupils attended at half price. These free scholarships are granted to poor girls upon the recommendations of church and orphan societies. Pupils upon entering must be provided with a certificate of birth and one of good character. Not more than 12 pupils are taken at a time because it is necessary for the matron to give her attention to each individual. They must be at least 15 years of age.

HOUSEKEEPING SCHOOL, BUCHS.

This school was founded May 1888 by the Women's Society for the Advancement of Public Utility of canton Aargau. All pupils board at the school.

The object of the school is to give to young ladies leaving school a good theoretical and practical training in all that relates to the duties of a housewife. Pupils are generally the daughters of the middle or wealthier classes.

The term is for three months and comprises the following courses:

Theoretical instruction.—Science of cooking—instruction concerning the most important nutritive substances in food and the arrangement of the latter accordingly, preparation of meals for the sick and for the healthy, preserving fruit and vegetables, methods of heating, suitable cooking utensils, fuel, etc.; science of nourishment—instruction concerning the chemical composition of the human body, its functions, its chemical changes, nutritive process, etc.; hygiene—instruction regarding the care of the body, the sustenance, clothing, habitation, air and ventilation; washing and cleaning—instruction regarding the care of articles during the process of washing, washing linens and other articles of wearing apparel, especially as to the application of washing appliances and chemicals, etc.; bookkeeping—instruction in keeping simple practical household accounts; science of housekeeping in general; lectures on the moral-religious duties of a housewife.

Practical instruction.—The preparation of meals for a good home table—this includes at present 31 varieties of soup, 19 ways of preparing beef, 25 of veal, 9 of pork, 4 of mutton, 11 of mixed meats, 4 of fish, 15 of poultry, 12 of game, 16 kinds of sauces, 37 ways of preparing green vegetables, 35 varieties of egg, milk, and farinaceous foods, 17 ways of serving omelets and eggs, 11 kinds of pastry, 11 of

warm puddings, 13 of cold puddings, 7 kinds of pudding sauces, 10 of creams, 7 kinds of stewed fruits, 4 kinds of dough, 28 varieties of cakes and tarts, 18 of small cookies, 7 of dumplings, and 9 of patties. For the purpose of giving the pupils ample opportunity in the cooking of these articles orders for cakes, meats, etc., are taken from outsiders for dinners, parties, etc. A book of recipes is published by the matron, covering all the dishes prepared at the school. This is sold only to pupils to be used as a memorandum of the cooking learned at the school. The practical instruction also includes regular and proper arrangement of the dining room, the kitchen, the dining table, as well as the manner of serving; practical points for buying food; instruction in washing, wringing, and ironing linens; cleaning the bedrooms, sitting rooms, cellars, and in fact the whole house; instruction in the making of bed and table linens, garments, taking measurements, drawing patterns, cutting and fitting ladies' dresses, which are optional.

There are no printed or written regulations for the government of the school, because it is desired to have the inmates considered like members of a family rather than as pupils.

Pupils rise at 5.30 to 6 a. m. in summer and at 6.30 to 7 a. m. in winter. Breakfast is had soon after. At 9 a. m. a lunch of bread and fruit is served. At 11.30 they have dinner, consisting of one or two kinds of meat, soup, vegetables, dessert, etc. From 2 to 5 or 5.30 p. m. the time is generally devoted to needlework and theoretical instruction. At 3 p. m. bread and coffee are served. At 6.30 or 7 p. m. supper is served, consisting of tea, meat, vegetables, pudding, etc. Pupils perform all the work of the school except the scrubbing. The matron has charge of the instruction. Once a week the pastor of the neighboring church lectures on the duties of housewives and other ethical subjects.

Only twelve young ladies are admitted to the school at a time. The applications for admission are generally twice the number of vacancies. Those applying are, as a rule, sisters, relatives, or friends of former pupils. The same pupils sometimes remain for two, three, or even four terms in order to obtain more practice. Since the school was opened in May 1888, 119 pupils have attended. They came from nearly all the cantons in Switzerland. They were young ladies who had finished their education but desired to perfect themselves in the duties of housewives. In many cases young ladies attended immediately before being married.

A committee elected from among the members of the society has general supervision over the affairs of the school.

The income of the school is derived from tuitions and the sale of food. It is slightly in excess of the current expenditures. The surplus is used for purchasing furniture and other household articles.

The tuition is 180 francs ($34.74) for the term of three months. This includes board and lodging. An extra charge of 5 francs (97 cents) per

quarter is made for the use of the piano. The materials for linens and other needlework are furnished by the pupils, and the finished articles belong to them.

Pupils not residing in the canton of Aargau must be provided with certificates of residence in Switzerland. Each pupil upon entering must have, besides her clothing, etc., 6 pocket handkerchiefs, 6 napkins, 6 towels, 4 linen sheets, 4 large aprons, and a blacking brush.

This institution is situated in a little village 20 minutes' walk from Aarau, in the midst of a large garden. It is furnished for the reception of only 12 pupils. The building contains 11 rooms, 2 kitchens, a laundry, a cellar, closets, etc. A hot air furnace heats nearly all the rooms. The arrangements and ventilation of the bedrooms are as nearly perfect as they can be made. A piano and sewing machine are at the disposal of the pupils. The pupils seemed happy and healthy, and everything had a cheerful, homelike appearance. Pupils are never permitted to go out except in groups, or in company with the matron, and no gentlemen are permitted to visit them except their fathers and *fiancés*.

HOUSEKEEPING SCHOOL, WORB.

This school was founded in May 1886 by the Economic and Public Utility Society of canton Bern. All pupils board at the school.

The object of the school is to train young ladies in industry and order, and to educate them in such a way as to make them capable of conducting independently a good city or country household.

The programme comprises a knowledge of housekeeping, such as cooking, baking, preserving fruit, meats, and vegetables, making beds, washing and ironing, and in general all classes of work required in a household; garden and vegetable culture (only for the summer class); needlework required in a household (no fancy work); lectures on ethics by the pastor of the village; lectures on hygiene by a physician; nutriment (the subject treated in a chemical, physical, and economic sense).

All practical work is done by the pupils under the supervision of the matron, no servants being kept in the establishment. There are three terms each year, two being of three months each and one of six months. Pupils must be up at 6 a. m. in summer and 7 a. m. in winter; those detailed for kitchen work a little earlier. Breakfast is had soon after, dinner at 12 m., and supper at 6 p. m. The day is spent in the performance of household work and sewing. Pupils retire at 9 p. m. A matron and one assistant are in charge of the instruction. On three hours per week lectures are delivered by the village pastor and by a physician. Four hours per week are devoted to instruction in bookkeeping and other theoretical subjects by a teacher of one of the public schools.

During the year 1890 the attendance was 21 pupils the first term, 22 the second term, and 21 the third term. The number is generally

limited to 21. Up to August 1891, 357 pupils had attended the school. They were daughters of the middle and wealthier classes who attended for no other purpose than to become useful in their own homes. Sometimes the pupils remain for a second term.

The school is owned by a stock company, having a capital of 7,000 francs ($1,351) in 70 shares of 100 francs ($19.30) each. The stockholders elect a board of four directors every three years, and the cantonal government appoints one, making in all five directors. These have immediate control of the affairs of the school, direct the interior arrangements, and make a report each year to the stockholders.

The school is self-supporting. The cantonal government pays an annual subsidy of 500 francs ($96.50). This, with the tuitions, more than covers the expenditures. A slight income is also derived from the sale of vegetables, and from interest on the capital. The income and expenditures during the year 1890 were as follows:

INCOME.

Balance from last year's account	$502.23
Tuitions	2,132.65
State subsidy	96.50
Interest	24.35
Donations	6.13
Sundries (sale of vegetables, etc.)	12.12
Total	2,773.98

EXPENDITURES.

Purchase of furnishings	65.57
Food	934.45
Fuel and light	109.86
Yearly salary of matron	193.00
Yearly salary of assistant matron	96.50
Expenses for lectures, teacher, per diem of directors, etc	154.53
Rent and insurance	196.47
Interest dividends to stockholders	57.90
Printing, reading and writing material, stationery, etc	43.87
Repairs	52.59
Linens	17.86
Seeds, plants, and garden materials	16.47
Placed in the reserve fund	193.00
Placed in the library fund	6.13
Sundries	7.64
Total	2,145.84
Balance on hand	628.14

The tuition is 130 francs ($25.09) for the three months' term and 250 francs ($48.25) for the six months' term. This includes board and room. The pupils must be at least 16 years of age when admitted. They must be provided with certificates of birth and residence in Switzerland. As the applications greatly exceed the vacancies candidates must often wait a year or more for their turn to be admitted.

This school was the outcome of a series of eight cooking courses held prior to 1886. That experiment led to the conclusion that in order to give thorough or even profitable instruction in cooking and housekeeping it was necessary to establish an institution where the pupils could live entirely during the term of instruction. The institution proved a success from its very beginning, both practically and financially. By placing the school in a small town, where rent was cheap, it was possible to get a large, well ventilated house with a fine garden, and at the same time the isolation which is often very desirable for a young lady's school. By the economic use of materials, which constitutes an important feature of the instruction, the expenses of the school amount, on an average, to 1.53 francs (29½ cents) per pupil per day.

INDUSTRIAL ART SCHOOLS.

These schools do not properly come within the scope of trade schools, and are therefore described very briefly.

The object of these schools is to prepare persons of both sexes for the various artistic professions, and to give instruction in technical and free-hand drawing, or artistic work, to artisans and others who may benefit in their vocations.

Schools of this kind exist in Geneva, Zurich, Saint Gall, Chaux-de-Fonds, Lausanne, Bern, Basel, Freyburg, Bienne, Lucerne, and Heimberg. The branches taught in these schools differ in some respects according to the particular industries prevalent in their vicinity.

MUNICIPAL SCHOOL OF ART, GENEVA.

The Municipal School of Art at Geneva, founded in 1751, is the oldest in Switzerland. The school is attended chiefly by persons who are following some vocation, as apprentices, students, workingmen, etc., and who can devote some time to perfecting themselves in the artistic features of their work. On July 3, 1891, it comprised the following divisions and branches: The preparatory division—containing 57 pupils; the middle division—comprising a class in ornamental drawing and elements of architecture, 19 pupils; a class in object drawing, 56 pupils; a class in modelling and ceramics, 36 male and 47 female pupils; a class in ornamentation, 53 pupils; a class in architecture, 29 pupils; the superior division—comprising a school of arts applied to industry, 42 male and 6 female pupils; a school of fine arts, 43 male and 20 female pupils; a school of art from nature, 48 pupils; and a school of arts for young ladies, 166 pupils. This makes a total attendance of 622 pupils for the scholastic year ending July 3, 1891. Attendance is gratuitous, it being a public institution.

CANTONAL SCHOOL OF INDUSTRIAL ARTS, GENEVA.

The school of industrial arts in Geneva more nearly approaches a trade school than the preceding. It is a cantonal institution subsidized by the federal government. The following are the subjects

taught, and the attendance during the scholastic year ending July 4, 1891:

	Pupils.
Class in figure and ornamental modelling	48
Class in chased work, bronze, brass, plate, etc	25
Class in sculpture in wood and stone	17
Classes in artistic iron work:	
Day pupils	7
Night pupils	14
Class in wood engraving	18
Class in ceramics, aquarelle, and composition	68
Total	197

Eighteen lectures on architecture, particularly Egyptian and Greek, were delivered during the year before all the classes.

Instruction is gratuitous. Pupils are in two categories—regular pupils and those taking only certain hours. The regular pupils must be at least 14 years of age, and must attend at the same time the Municipal School of Art, the hours being apportioned between the two schools. The irregular pupils are generally apprentices, workingmen, or persons in mercantile occupations who desire to perfect themselves in certain lines of artistic work, but are occupied with their vocations the greater part of their time. These can be admitted by proving themselves competent to follow the course of instruction which they select. Studies are made from living models, plants, casts, and copy. A garden adjoins the school for the use of the students.

INDUSTRIAL ART SCHOOL, ZURICH.

The Industrial Art School of Zurich educates persons of both sexes in such branches as are essential for the different industrial arts, more particularly draughtsmen, lithographers, drawing teachers, decorative painters, glass stainers, modellers, sculptors, carvers, gilders, potters, cabinetmakers, silversmiths, goldsmiths, etc. Below are given the subjects taught, the number of hours per week, and the attendance during the year ending April 1890:

COURSE OF STUDY AND ATTENDANCE

Subject.	Summer half-year, 1889.		Winter half-year, 1889–'90.	
	Pupils.	Hours.	Pupils.	Hours.
Ornamental drawing	39	9	50	10
Drawing flowers and plants	31	7	34	7
Object drawing	34	16	42	16
Drawing the human head	19	3	16	4
Posture drawing	19	4	15	4
Decorative painting	5	21	14	16
Architectural drawing and exercises in composition	38	4	44	4
Painting on china	12	9	12	8
Ornamental compositions	14	6	14	7
Modelling	7	16	12	18
Wood carving	5	22	4	26
Styles	30	2	27	2
Geometrical drawing	21	6	19	5
Perspective	12	3	15	3
Perspective free-hand drawing	.....	.....	11	2
Method	.....	.....	6	2
Technical drawing in workshops	9	5	9	4
Carpenter workshops	9	34	9	37

The tuition is 30 francs ($5.79) per six months. An admission fee of 5 francs (97 cents) is paid in addition. Pupils must be at least 15 years of age, and must have sufficient previous education to be able to follow the classes. They are put on probation for a limited time. Pupils are divided into two categories—those who attend regularly and study for some profession and those who attend only a few hours per day or week and devote their time to some other vocation. The former must attend two years, as a rule, in order to graduate. Those attending the carpenter workshops serve an apprenticeship of three years. An extensive industrial museum, a library, and a reading room are at the disposal of pupils.

DRAWING SCHOOL FOR TRADES AND INDUSTRIES, SAINT GALL.

The Drawing School for Trades and Industries at Saint Gall teaches the various branches of drawing and modelling, but devotes special attention to embroidery designing and pattern enlarging, this being the prevailing industry in the vicinity. Pupils attend either regularly or by the hour. The classes during the year ending May 1891 were formed as follows:

CLASSES AND ATTENDANCE.

Class.	Attendance.		
	First three months.	Second three months.	Third three months.
Free-hand drawing	28	20	17
Perspective			1
Modelling	2	3	2
Object drawing	25	26	22
Technical drawing	1	3	4
Pattern enlarging	43	44	36
Styles		29	29
Drawing from nature	60	53	49
Pattern drawing (embroidery)	16	15	15
Drawing for weaving industry	11	10	11
Machine embroidery	4	6	6

The pupils studied for the following occupations:

	Pupils.
Designers of patterns	51
Enlargers of embroidery patterns	23
Draughtsmen	17
Various trades	14
Merchants and manufacturers	10
Amateurs	20

There were in all 135 pupils at the school during the year. Of these 25 were female pupils, 12 had free scholarships, and 2 had stipends. One hundred and four attended the full time and 31 attended by the hour.

The class in machine embroidery was recently inaugurated, but promises to be an important feature of the school. The course of instruction for regular pupils is intended to cover three and one-half years. Certificates of graduation are not issued unless pupils have attended the full time. Pupils must be at least 15 years of age, and are put on one to two months' probation before being considered regular pupils.

Besides the above professional branches of drawing the school has also two other divisions—the school for amateurs and the women's industrial school. The former had, during the same period as above, the following classes for young ladies: Needlework, 20 pupils; painting and drawing, 16 pupils; study of styles and history of art, 8 pupils.

The women's industrial school comprised the following classes: For teachers of needlework, 10 pupils; course in hand sewing and mending, 15 pupils; machine sewing, 22 pupils; dressmaking, 14 pupils; method, 15 pupils; pedagogics, 20 pupils; classes in ironing, 37 pupils.

The other schools of industrial arts do not differ materially from the four described, and it is not necessary to describe them in detail.

INSTITUTIONS FOR THE EDUCATION OF WORKING PEOPLE.

These are the most extensive technical institutions in Switzerland. They aim to give to workingmen and women opportunities for devoting their leisure time to the study of free-hand and technical drawing, needlework, bookkeeping, and such other branches as serve to elevate working people both professionally and socially.

The first school of this kind was founded in Switzerland in the beginning of the present century at Zurich, by a private society. It was a drawing school for apprentices. From 1820 to 1830 schools were established at Aarau, Baden, and Zug on a similar plan; from 1840 to 1850 nine more were established; and from 1850 to 1865 seventy-eight more were organized. From that time to the present these evening and Sunday industrial schools increased very rapidly in number.

In 1889, according to statistics collected by M. Grob, secretary of public instruction at Zurich, there were 1,184 of these schools in Switzerland, in 743 of which the attendance of apprentices was obligatory and in 441 it was optional. The former were attended by 12,250 male pupils and the latter by 12,289 male and 2,177 female pupils—making a total attendance in 1889 of 26,716 persons. Most of these are simply drawing schools, while the others teach quite a variety of additional useful subjects.

The following list of subjects taught in 87 of the principal schools of this kind during 1890 will give an idea of the various subjects treated:

SUBJECTS TAUGHT IN INSTITUTIONS FOR THE EDUCATION OF WORKING PEOPLE.

[The list was prepared by Rev. J. Christinger, national inspector of high schools, Switzerland.]

Subject.	Schools.	Per cent.
Drawing (free-hand, technical, geometrical, etc.)	87	100.00
Modelling (in clay, gypsum, or wood)	26	29.89
Architecture (theoretical)	11	12.64
Geometry	45	51.72
Bookkeeping	42	48.28
Penmanship or calligraphy	12	13.79
Physics	8	9.20
Chemistry	3	3.45
Hygiene	2	2.30
Technology	1	1.15
Native language (composition, business forms, etc.)	31	35.63
French, German, or Italian—not native	19	21.84
English language	2	2.30
History of native country	19	21.84
Political and social economy	1	1.15
Housekeeping, needlework, etc., for women	1	1.15
Stenography	2	2.30
Religion	1	1.15
Gymnastics	1	1.15

The 87 schools included in the above statistics obtain subsidies from the federal government. The instruction at these schools is mostly gratuitous, and is given in the evenings and on Sundays. The support originally came from private individuals, trade guilds, and from societies for the advancement of public utility. Later most of them became municipal and cantonal institutions, and since the adoption of the federal resolution in 1884, granting subsidies to professional and industrial institutions of learning, a number have availed themselves of this assistance.

Following is a description in detail of a number of the most important of these institutions:

INDUSTRIAL SCHOOL, RIESBACH.

This school was founded in 1879. It is supported by national subsidies, public school funds, tuitions, and the local trade guild. The income in 1889 was—national subsidy, 1,200 francs ($231.60), other contributions, 3,190 francs ($615.67), expenses, 4,387.04 francs ($846.70); both sexes are eligible. The tuition is 2 francs (39 cents) for six months. Copy books and drawing paper are gratuitous. The school is administered by a committee of the local trade guild and a representative of the district school board. The faculty consists of 12 teachers. The attendance was 195, of whom 73 were over 18 years of age. Instruction is given all the year. The courses of study and the hours devoted to each are as follows:

	Hours.
Sunday mornings:	
Free-hand drawing	3
Geometrical drawing	3
Perspective drawing	3
Machinery drawing	3
Architectural and furniture drawing	3
Week day evenings:	
Modelling in clay	4
German language (native)	3
Arithmetic—	
First class	2
Second class	2
Bookkeeping	2
Penmanship	2
French language—	
First class	3
Second class	4
Week days:	
Course in cutting for ladies' tailors	6 to 7

SCHOOL FOR PROFESSIONAL IMPROVEMENT, WINTERTHUR.

This school was founded in 1862. It is supported by national subsidies, the local society for the advancement of public utility, the canton, and by tuitions. Tuition is 2 francs (39 cents) for six months. The government is by a mixed board, consisting of delegates from the school board, trade guilds and industrial societies, and the Technicum. The faculty in the summer of 1890 consisted of 10 teachers; in the winter of 1890–'91, 17 teachers. The attendance during the year 1890–'91 was 313 pupils. Instruction is given all the year. Following are the classes and hours of each:

Summer, 1890.

	Hours.
Sundays:	
Free-hand drawing	3½
Linear drawing	2½
Sketching—	
First class	2½
Second class	2½
Mechanical technical drawing—	
First class	2½
Second class	2½
Technical drawing for carpenters and builders	2½
Week day evenings:	
Modelling and wood carving	3
Measurement of surfaces and bodies	1½
Penmanship	1

Winter, 1890–'91.

Sundays:	
Free-hand drawing	2½
Linear drawing	2½
Sketching—	
First class	2½
Second class	2½

Sundays—concluded.

	Hours.
Mechanical technical drawing—	
First class	2½
Second class	2½
Technical drawing for builders—	
First class	2½
Second class	2½
Week day evenings:	
Free-hand drawing	2
Modelling and wood carving	3
History	1
Commercial arithmetic	3
Bookkeeping	1½
Elements of mechanics	1½
Perspective	1½
Business forms	1½
French language (foreign)	4

WORKINGMEN'S SCHOOL, BERN.

This school was founded in 1829. It is a private institution subsidized by the federal government. The tuition for the winter half-year is 6 francs ($1.16); for the summer half-year, 4 francs (77 cents). It is governed by 13 directors and 1 school board inspector. The faculty consists of 19 teachers. The attendance was 291 pupils, of whom 217 were over 18 years of age. Instruction is given during the entire year. Following is the programme of instruction:

Week day evenings:

	Hours.
Ornamental drawing—	
Preliminary	4½
From casts	4½
Architecture, theoretical	3
Technical drawing (one and one-half hours Sundays)	4½
Modelling	3
Technical drawing, preliminary—	
First class	4½
Second class	4½
Technical drawing, architectural (one and one-half hours Sundays)	9
Study of building and construction work (one and one-half hours Sundays)	1½
Drawing from small iron models (one and one-half hours Sundays)	7½
Drawing from large iron models (one and one-half hours Sundays)	7½
Constructive models in wood	4½
Drawing for gardeners (one and one-half hours Sundays, in winter only)	1½
Bookkeeping, arithmetic, and business forms—	
First class (one and one-half hours Sundays, in winter only)	3
Second class (one and one-half hours Sundays, in winter only)	3
Third class (one and one-half hours Sundays, in winter only)	3

INDUSTRIAL SCHOOL, ZURICH.

This school was founded in 1873. It is supported by a special society, and subsidized by the city, canton, and federal government. Its income in 1889 was—national subsidies, 5,700 francs ($1,100.10), other contributions, 11,733 francs ($2,264.47). Total expenses, 23,688.35 francs ($4,571.85). It is governed by a committee of the special society. The

ulty consists of 23 teachers. The attendance was 451 pupils, of om 151 were over 18 years of age. Following are the courses of in- uction and hours for each class:

	Hours.
k day evenings:	
Free-hand drawing	4
Free-hand perspective drawing	2
Modelling	4
Arithmetic for apprentices	1½
Arithmetic for workingmen—	
First class	1½
Second class	1½
Geometry	1½
Geometrical drawing	2
Penmanship	3
Calligraphy (engrossing)	1½
Business forms—	
First class	1½
Second class	1½
Single entry bookkeeping	2
History and constitution of Switzerland	2
Technical drawing, etc., for shoemakers	2
Technical drawing, etc., for tailors	4
French language—	
First class	3
Second class	3
Third class	3
day mornings:	
Technical drawing for paper hangers and upholsterers	3
Technical drawing for masons and stonecutters	3
Technical drawing for carpenters and builders	3
Technical drawing for cabinetmakers	3
Technical drawing for mechanics—	
First class	3
Second class	3
Technical drawing for locksmiths	3
Technical drawing for tinners	3

SCHOOL FOR PROFESSIONAL IMPROVEMENT, SAINT GALL.

'his institution was founded in 1860. It is supported by the com- nity and by national subsidies. Its income for the year 1890–'91 3—1,995 francs ($385.04) from the federal government, 2,000 francs 86) from the local school board, 2,400 francs ($463.20) from the can- al government, and 2,300 francs ($443.90) from the board of trade. 3 tuition is—for the summer half-year, 4 francs (77 cents) and 1 franc cents) for materials; for the winter half-year, 6 francs ($1.16) and 2 ncs (39 cents) for materials. The courses of instruction during the r 1890–'91 and hours per week for each class were as follows:

	Hours.
day mornings:	
Elementary free-hand drawing—	
First class	4
Second class	4
Sketching from nature	4
Geometrical drawing	4

	Hours.
Week day evenings:	
Projection drawing—	
First class	3
Second class	3
Sunday mornings:	
Architectural drawing—	
First class	4
Second class	4
Machinery drawing—	
First class	4
Second class	4
Week day evenings:	
Free modelling	6
Constructive modelling	6
German language (native)	3
Arithmetic and bookkeeping—	
First class	2
Second class	2
Third class	2
Fourth class	2
Penmanship—	
First class	2
Second class	2
Geometry—	
First class	2
Second class	2
Physics	3
History and constitution of Switzerland	3

PROFESSIONAL ACADEMY, GENEVA.

The division for men was founded in 1883. It is supported by the city and by national subsidies. The expenditures in 1889 were 12,350.45 francs ($2,383.64), of which 2,909 francs ($561.44) were from the federal government. It is governed by the city school board. The tuition is 1 franc (19 cents) per course. The faculty consists of 10 teachers. The attendance at the end of the year 1889 was 232 pupils, of whom 200 were over 18 years of age. Instruction is given from October 15 to April 31. Following are the courses of instruction and hours per week for each class:

	Hours.
Week day evenings:	
Free-hand drawing—	
First class	1½
Second class	1½
Technical drawing for mechanics (two lessons)	4
Technical drawing for locksmiths (two lessons)	4
Technical drawing for cabinetmakers (two lessons)	4
Practical course for upholsterers (two lessons)	3
Practical course in furniture ornamenting (two lessons)	4
Practical course for tailors (two lessons)	4
Practical course for shoemakers (four lessons)	8
Chemistry	2
Penmanship (two lessons)	2
Bookkeeping (two lessons)	4

The division for women was founded in 1885. It is supported in the same manner as the division for men. The expenditures are included in the amounts shown for that division. A special committee of management is appointed by the city. The attendance in 1889 was 459 pupils, of whom 216 were over 18 years of age. The instruction comprises two courses—one from September 1 to December 1, the other from January 15 to April 15. Tuition is 1 franc (19 cents) per course. The courses of study are given on week day evenings and comprise: Cutting ladies' garments, cutting children's garments, cutting linens, machine sewing, each branch two lessons of one and one-half hours each; embroidery designing, one lesson of one and one-half hours; dry cleaning and ironing, two lessons of three hours each; calligraphy and bookkeeping, two lessons of one and one-half hours each.

The federal government, by virtue of the resolution of the Swiss congress, adopted in 1884, expended during the year 1890 the sum of 57,997 francs ($11,193.42) in subsidies for these institutions for the further development of the working people.

THE TECHNIKUM, WINTERTHUR.

This school, founded in 1873 as a cantonal institution, fits young men for such positions as come between those of ordinary tradesmen and the higher professions.

It contains six distinct divisions, as follows: A school for builders, a school for mechanical and electrical engineers, a school of industrial chemistry, a school of industrial arts, a school for surveyors, and a mercantile school.

The school for builders aims to render the pupils competent to execute designs and mathematical calculations for all kinds of construction work, to superintend the latter, and to thoroughly understand the work incident to the building trades of masonry, carpentry, and stone cutting. It seeks to educate the pupils to a proper understanding of architecture and its relation to the work of building and constructing, and in general to fit them for the professions of architect and builder, and construction engineer.

COURSE OF INSTRUCTION IN THE SCHOOL FOR BUILDERS, WINTERTHUR.

Subject.	Hours per week.	Subject.	Hours per week.
First half-year.		*Second half-year.*	
Algebra	4	Algebra	3
Arithmetic	4	Chemistry	3
Chemistry	3	Drawing, architectural	5
Drawing, free-hand	4	Drawing, geometrical	4
Drawing, linear	6	Drawing, ornamental	4
Geometry, stereometric	4	Geometry, stereometric	2
German language	3	German language	2
Physics	3	Physics	3
		Science of building	2
		Science of construction	4
		Trigonometry	2
Total	31	Total	34

COURSE OF INSTRUCTION IN THE SCHOOL FOR BUILDERS, WINTERTHUR—Concluded.

Subject.	Hours per week.	Subject.	Hours per week.
Third half-year.		*Fourth half-year—concluded.*	
Drawing, architectural	9	Science of construction	7
Drawing, geometrical	4	Study of architectural stone cutting	2
Drawing, ornamental	5	Study of building materials	2
Geometry, practical	2	Study of specifications, contracts, superintending, etc.	1
Mathematics	2	Total	30
Mineralogy	2	*Fifth half-year.*	
Modelling, ornamental	5	Architectural designing	15
Science of building	4	Architecture, orders of	3
Science of construction	6	Bookkeeping	2
Total	39	Drawing, ornamental	4
Fourth half-year.		Drawing, perspective	2
Calculating cost of production	3	Heating and ventilation	2
Drawing, architectural	8	Modelling, ornamental	3
Drawing, ornamental	6	Plumbing and lighting	1
Making models for construction work	3	Science of construction	4
Mechanics as applied to building	3	Study of building laws	1
Modelling, ornamental	3	Study of earthwork and road construction.	4
Science of building	1	Total	41

The school for mechanical and electrical engineers aims to perfect pupils for the positions of mechanical and electrical engineers, skilled mechanics, and foremen of machine shops. Pupils are taught to thoroughly understand the construction of machinery and such branches of theoretical work as are necessary to make them superior in technical knowledge to ordinary mechanics. It also offers opportunities to manufacturers for learning to understand and judge the mechanisms of machinery and engines. Special courses are given to persons interested in spinning and weaving. Persons desiring to become electrical engineers follow the same course as the others during the first three half-years; during the fourth and fifth half-years they take a special course.

COURSE OF INSTRUCTION IN THE SCHOOL FOR MECHANICAL ENGINEERS, WINTERTHUR.

Subject.	Hours per week.	Subject.	Hours per week.
First half-year.		*Fourth half-year.*	
(Same as in school for builders.)		Cotton spinning, optional	3
Second half-year.		Drawing, mechanical technical	9
Algebra	4	Mathematics	4
Chemistry	3	Mechanics	7
Drawing, free-hand	4	Practice in machine construction	9
Drawing, geometrical	4	Science of construction	5
Drawing, mechanical technical	7	Statics	1
Geometry	4	Technology	2
German language	2	Total	40
Physics	4	*Fifth half-year.*	
Total	32	Bookkeeping	2
Third half-year.		Calculating weight and value of machinery.	1
Algebra	4	Cotton spinning and weaving, optional.	3
Drawing, geometrical	3	Geometry, practical	2
Drawing, mechanical technical	10	Heating systems	1
Geometry	3	Mechanics	5
Mechanics	4	Practice in machine construction	19
Science of construction	5	Science of construction	5
Strength and resistance of materials	3	Statics	1
Physics	3	Water power, study of	1
Total	35	Total	40

E OF INSTRUCTION IN THE SCHOOL FOR ELECTRICAL ENGINEERS, WINTERTHUR.

Subject.	Hours per week.	Subject.	Hours per week.
First three half-years.		*Fifth half-year.*	
as in school for mechanical s.)		Bookkeeping	2
Fourth half-year.		Chemistry, practical	8
		Drawing, mechanical technical, and practice in construction work.	10
ry	2	Electrotechnical practice and work	8
; mechanical technical, espe- electrical machines, etc.	6	Electrotechnics, principles of	4
ty	3	Science of construction	4
schnical practice and work	6	Total	36
atics	4		
ca	7		
of construction	5		
	1		
ogy	2		
tal	36		

school of industrial chemistry fits pupils for the positions of cal chemists in the arts and industries. Besides giving the sary theoretical instruction in chemistry it affords pupils oppor- es for making special studies according to their future vocations, as for bleachers, dressers, dyers, or printers of textiles. Pupils esire to obtain positions where a knowledge both of chemistry machinery is necessary often attend this school and that for me- cal engineers in succession.

URSE OF INSTRUCTION IN THE SCHOOL OF CHEMISTRY, WINTERTHUR.

Subject.	Hours per week.	Subject.	Hours per week.
First half-year.		*Fourth half-year.*	
ie as in school for builders.)		Bookkeeping	2
Second half-year.		Chemistry, organic	5
		Descriptive studies of machinery and instruments.	3
	3	Dyeing and printing	6
ry	3	Laboratory work	16
; free-hand	4	Physics, chemical	2
; technical	5	Technology, chemical	3
y	4		
language	2	Total	
ory work	8		37
	3		
ive analysis	1	*Fifth half-year.*	
tal	33	Chemistry, agricultural	3
		Drawing, technical	6
Third half-year.		Dyeing and printing	3
		Laboratory work	20
ry, analytical	3	Microscopic work	3
ry, inorganic	3	Technology, chemical	3
ry, organic	5		
ory work	18	Total	38
ogy	2		
chemical	2		
ogy, chemical	3		
otal	36		

The school for surveyors has for its principal object the education of young men for the profession of surveyor by teaching such branches as will enable them to pass the state examinations required for this profession. With this end in view pupils have, in addition to theoretical work, practical exercises with the level and in making surveys according to the regulations required by law. It also aims to fit pupils for the requirements of road, street, and other simple construction work, drainage, irrigating canals, etc., and in fact all work which comes within the scope of surveying.

COURSE OF INSTRUCTION IN THE SCHOOL FOR SURVEYORS, WINTERTHUR.

Subject.	Hours per week.
First half-year.	
Algebra	4
Arithmetic	4
Chemistry	3
Drawing, free-hand	4
Drawing, linear	6
Geography	2
Geometry	4
German language	3
Penmanship	1
Physics	3
Total	34
Second half-year.	
Algebra	4
Calligraphy	1
Chemistry	3
Draughting plans	6
Drawing, geometrical	4
Geography	2
Geometry	4
German language	3
Physics	3
Planimetry and stereometry, exercises in.	2
Total	32
Third half-year.	
Algebra	4
Draughting plans	4
Drawing, geometrical	3
Geometry	8
Third half-year—concluded.	
German language	3
Mineralogy	2
Physics	3
Surveying	5
Trigonometry and logarithms	2
Total	34
Fourth half-year.	
Algebra	2
Building mechanics	3
Draughting plans and charts	6
Geometry, practical	6
Mathematics	4
Planimetry, stereometry, trigonometry, etc., exercises in.	4
Science of construction	4
Study of building materials	2
Trigonometry, spherical	2
Total	33
Fifth half-year.	
Chemistry, agricultural	3
Draughting plans and charts	4
Geometry, practical	4
Earth and road construction work	4
Hydraulics and drainage	3
Irrigation, etc	1
Professional calculation	2
Surveying	10
Total	31

The school of industrial arts aims to fit pupils for designers, teachers of drawing, decorators, etc. By means of practical exercises and special instruction it offers (in connection with the school of chemistry) facilities for ceramic decoration, glass staining, and reproduction work. It gives a good foundation to all who desire to devote themselves to an artistic profession.

COURSE OF INSTRUCTION IN THE SCHOOL OF INDUSTRIAL ARTS, WINTERTHUR.

Subject.	Hours per week.
First half-year.	
Arithmetic	4
Chemistry	3
Drawing, free-hand	18
Drawing, linear	6
German language	3
Modelling	6
Total	40
Second half-year.	
Chemistry	3
Drawing, free-hand	a 17
Drawing, geometrical	2
Drawing, industrial	a 10
German language	2
Modelling	a 6
Total	40
Third half-year.	
Drawing, free-hand	a 14
Drawing, industrial	a 12
Drawing, perspective	2
Modelling	a 6
Third half-year—concluded.	
Study of building parts	4
Study of styles	6
Total	44
Fourth half-year.	
Anatomy	1
Drawing, architectural	5
Drawing, free-hand	a 10
Drawing, industrial	a 15
Modelling	a 5
Study of styles	6
Total	42
Fifth half-year.	
Anatomy	2
Drawing, free-hand	a 14
Drawing, industrial	a 18
Modelling	a 6
Study of styles	4
Total	44

a Instruction varies with the proposed future occupation of the pupil.

The mercantile school aims to prepare young men for mercantile pursuits. Special attention is therefore given to languages and mathematics, besides such other studies as are essential in a mercantile career. Special courses of study are given in the knowledge of goods, including laboratory work for such as intend to enter business requiring such knowledge.

COURSE OF INSTRUCTION IN THE MERCANTILE SCHOOL, WINTERTHUR.

Subject.	Hours per week.
First half-year.	
Algebra	4
Arithmetic	4
Chemistry	3
English language	4
French language	4
Geography	2
German language	3
History, especially commercial	2
Italian language	3
Penmanship	1
Physics	3
Stenography	1
Total	34
Second half-year.	
Algebra	3
Arithmetic, commercial, and book-keeping.	4
Calligraphy	1
Chemistry	3
English language	4
French language	4
Geography	2
German language	3
History	2
Italian language	4
Physics	3
Stenography	1
Total	34
Third half-year.	
Arithmetic, commercial, and book-keeping.	5
Arithmetic, political	2
Calligraphy	1
Commercial economy	3
English language	4
Exchange	2
French language	4
Geography, commercial	3
German language	3
Italian language	4
Knowledge of goods	3
Total	34
Fourth half-year.	
Arithmetic, commercial, and book-keeping.	5
Arithmetic, political	2
Calligraphy	1
Commercial economy	3
Commercial laws	1
English language	4
French language	4
Geography, commercial	3
German language	3
Italian language	4
Knowledge of goods	2
Total	32

Two hours' instruction per week is given in gymnastic exercises to all who desire to take part. Lessons in foreign languages may be taken also by pupils of the other divisions, three hours per week in French, English, or Italian being given those desiring it. Foreigners not thoroughly conversant with the German language can obtain extra instruction during the first half-year. Pupils of all the technical branches are at liberty to attend classes in the commercial school, provided it does not interfere with their own obligatory studies.

Special classes for professional improvement are held for persons desiring to become teachers of drawing in schools. The following is the course of study for such classes: Perspective, 4 hours per week; architectural drawing, 21 hours per week; mechanical technical drawing, 15 hours per week.

Classes for all divisions are formed on the third Monday in April and the first Monday in October. Vacations are had for two weeks before the April opening, seven weeks before the October opening, and ten days at Christmas. The regular hours of session are from 8 a. m. to noon and from 2 to 6 p. m. In special cases instruction is given as early as 6 a. m. and as late as 7 p. m.

This institution does not undertake to educate pupils in manual work further than laboratory work, experimenting, or testing. It is intended that pupils of the school for builders and mechanical engineers should have served an apprenticeship before entering. Where they have not done so they may, after having completed the three years at the Zurich high school, serve an apprenticeship in the trade school for metal workers, after which they can omit the first year's classes upon entering the Technikum. This latter step is generally taken by persons desiring to become mechanical engineers.

During the school year of 1890–'91 the faculty was composed of 18 professors and 13 instructors, their director being also professor of German and English. The attendance during the same year, 1890–'91, was as follows:

ATTENDANCE AT THE TECHNIKUM, 1890–'91.

School for—	Classes of summer 1890.					Classes of winter 1890–'91.				
	First half-year.	Third half-year.	Fifth half-year.	Total.	Transient.	Second half-year.	Third half-year.	Fourth half-year.	Total.	Transient.
Builders	16	4	11	31	2	41	23	12	76	8
Electrical and mechanical engineers.	61	86	52	199	4	108	.....	70	178	6
Industrial chemistry.	8	13	8	29	2	21	.....	11	32	2
Industrial arts	7	8	11	26	14	9	.....	*18	27	24
Surveyors	8	5	6	19	.....	10	.....	7	17	.....
Commerce	18	18	.....	36	150	29	.....	16	45	124
Special courses	.....	.....	.....	14	.....	.....	.....	.....	.....	.....
Total	118	134	88	354	172	218	23	134	375	164

Total attendance in summer, 526; in winter, 539. During the summer season 1890, 28 pupils had free scholarships with stipends amount-

ing to 2,070 francs ($399.51), 17 had free scholarships without stipends, and 7 transient pupils had free admission. During the winter season, 1890–'91, 30 pupils had free scholarships with stipends amounting to 2,310 francs ($445.83), 21 had free scholarships without stipends, and 7 transient pupils had free admission.

Nearly all graduates of this institution now hold positions of importance in establishments, or are themselves proprietors. It sometimes happens that for positions of directors of manufacturing establishments and similar positions graduates compete successfully with those of higher technical institutions, such as the polytechnic school at Zurich, or of universities. Pupils who graduate from the Technikum have not as thorough a scientific training as those from the higher technical institutions, but as they are enabled to begin practical work earlier they have the advantage of practice by the time they reach the age required for graduating from the higher schools. They are satisfied with lower positions at the beginning, but advance rapidly. Following is a list of the present occupations of those concerning whom information could be obtained:

OCCUPATIONS OF GRADUATES OF THE TECHNIKUM.

Occupation.	Number.
Mechanical engineers, master mechanics, etc	122
Builders, contractors, superintendents of construction, etc	62
Architects	18
Electrical engineers	23
Surveyors	33
Directors of manufacturing establishments	10
Chemists	25
Manufacturers (proprietors)	7
Merchants	5
Experts (silk, paper, and cement works)	6
Chemical dyers	2
Foresters	2
Locksmith (master)	1
Millwright	1
Optician	1
Administrator	1
Master stonecutter	1
Potter	1
Lithographer	1
Bleacher	1
Student	1
Total	334

These are not all the graduates, but a sufficient number to give a fair idea of the results of the instruction at the Technikum.

The tuition is 30 francs ($5.79) per six months for regular pupils and 2 francs (39 cents) per week for transients. Pupils in the schools for chemists and electrical engineers and others doing laboratory work pay an additional fee of 20 francs ($3.86) per six months. Pupils who are specially deserving may obtain free scholarships, with or without stipends, or they may have the tuition partially remitted. This applies, as a rule, only to citizens of canton Zurich.

Applications for admission to the institution are made in writing to the director, stating which school the applicant desires to attend. Ap-

plications must be accompanied by the certificate of birth of the applicant, the written consent of his parents or guardians (in the case of minors only), his certificate of education, his certificate of practical experience, and a certificate of moral character from the last teacher or from the civil authorities of his place of residence. The institution admits regular and transient pupils. The regular pupils are obliged, as a rule, to attend all the classes prescribed by the programme of the school which they enter. The transients attend only certain classes. Pupils entering the lowest class must be at least 15 years of age. Those entering higher classes must be correspondingly older. Examinations for admission comprise German composition, arithmetic, including percentage and interest, algebra, including simple equations with one unknown quantity, plane geometry, and elements of stereometry. For pupils entering the mercantile school a knowledge of French verbs and simple translation from French into German is required in addition, and for the other schools a knowledge of elementary free-hand and geometrical drawing is necessary.

Applicants appear for examination at 8 a. m. on the first day of the opening of the school in April and October. They are either accepted at once or put on three months' probation, after which they are rejected if found incompetent. Transient pupils must also pass examinations upon entering to prove themselves competent to follow the course of instruction.

THE POLYTECHNIC SCHOOL, ZURICH.

This school was founded in 1854 as a federal institution. It aims to fit young men for the higher technical professions, and includes the following departments: A school of architecture, course, three and a half years; a school of civil engineering, course, three and a half years; a mechanical technical school, course, three and a half years; a chemical technical school, comprising two divisions—a school for industrial chemists, the course comprising three years, and a school for pharmacists, two years; a school of agriculture and forestry, comprising three divisions—a school of forestry, course, three years, a school of agriculture, two and a half years, and a school of agricultural engineering, three and a half years; a school for special teachers of mathematics and natural sciences, comprising two divisions—the division for mathematics and the division for natural sciences, the time varying according to the special studies of the students (the normal time for the former division is four years and for the latter three years); a division for general philosophical and political subjects, comprising, first—mathematical, scientific, and technical lectures, partially to supplement the courses of the other schools, second—philosophical and political lectures, third—military science.

The faculty consists of 63 professors, 36 lecturers, and 13 assistants.

:he scholastic year ending March 21, 1891, the attendance
llows:

ATTENDANCE AT THE POLYTECHNIC SCHOOL, 1890–'91.

Department.	Swiss.	Foreigners.	Total.
:hitecture	19	15	34
il engineering	58	105	163
echnical school	77	109	186
:hnical school	54	93	147
istry	16	3	19
ricultura	28	13	41
ricultural engineering	2	2	4
ecial teachers	25	9	34
of regular students	279	343	622

umber of transient students, such as attended only certain
r lectures, was 339, making the grand total attendance for the
students.

uition during the year 1890–'91 was 100 francs ($19.30). In
to this 5 francs (97 cents) are paid for registry, 5 francs (97
or the sick fund, and 5 francs (97 cents) for the use of the
nd reading rooms. For attending lectures not included in the
f instruction a fee of 5 francs (97 cents) per six months is
for each series. For laboratory or workshop attendance an
of 50 francs ($9.65) in winter and 45 francs ($8.69) in summer
ed every six months for the analytical and the chemical tech-
oratory; a fee of 40 francs ($7.72) in winter and 35 francs
n summer for the agricultural chemical laboratory; 20 francs
or the chemical laboratory for mechanics; 10 francs ($1.93) for
l workshops; 5 francs (97 cents) for the modelling workshops;
s ($7.72) for 6 hours per week, 60 francs ($11.58) for 12 to 16
er week, and 80 francs ($15.44) for daily use of the physical
ry; 15 francs ($2.90) for the photographic laboratory; and 10
ancs ($1.93 to $3.86) for the zoölogical laboratory. For the
of the different chemical laboratories (for advanced pupils)
s 60 francs ($11.58) per six months.

xaminations for admission to the polytechnic school take place
in October. The nature of the examination is similar to
uired for persons entering a university. The applicant must
—a written application giving name and address, the occu-
e desires to follow, and the particular school and class he
o enter; written permission from parents or guardian, and
of the same; a certificate showing the age of the appli-
be at least 18 years; a satisfactory certificate of moral char-
m the school or civil authorities of the place from which he
certificate showing the studies and practical work already
d by the applicant; a travelling pass or certificate of residence.
oard of trustees is appointed by the federal government. The

meetings are held as a rule in Zurich, where the president of the board resides. This board is appointed for five years and consists of the president and six members. The principal of the school attends the meetings and has a voice in the deliberations. The federal council has superior authority in the direction and government of the school.

The school possesses a library and a collection of art works and casts of figures and architectural ornaments for the different branches of art study; a collection of building materials and models of constructions; a collection of patterns for machinery; a collection of instruments for geometrical measurement; a collection of tools and materials for mechanical technical instruction; a collection of models and materials for chemical, technological, and pharmaceutical instruction; a collection of necessary apparatus, models, tools, machinery, implements, and seeds for the instruction in forestry and agriculture; a zoölogical, botanical, mineralogical, geological, and paleontological collection; an entomological collection; an archæological collection and a collection of antique vases; a collection of copper plates; a workshop for modelling in clay and gypsum; a shop for wood work; a shop for metal work; a chemical laboratory for analytical work; a chemical laboratory for technical and pharmaceutical work; a chemical laboratory for agricultural and forestry work; a physical laboratory for plant studies; a physical cabinet with laboratory; an astronomical observatory; a botanical garden; a special botanical garden for the study of agriculture and forestry; forests, fields, collections, and libraries belonging to the city and canton of Zurich and placed by contract at the disposal of the polytechnic school.

CHAPTER XI.

IE KINDERGARTEN IN RELATION TO MANUAL TRAINING.

CHAPTER XI.

THE KINDERGARTEN IN RELATION TO MANUAL TRAINING.

The changes in the plans of the Department, as noted in the letter of transmittal, have prevented the collection of material on any very extended scale relative to the progressive educational work starting with the kindergarten and closing with the higher grades of grammar schools. The importance of consecutive and persistent training in any particular direction, especially as contemplated under any manual training course, is recognized by all educators, but, unfortunately, theories on this subject are too often in the nature of abstractions, deriving but little support from practical experience; and it is to be regretted that the results of such experience could not have been obtained from a greater variety of sources in order that views and theories, now based chiefly on hypothesis and assumption, might be verified or corrected by a wider induction.

Under existing circumstances, however, a few prominent illustrations must suffice. The first of these relates to the experiments in the public schools of Mont Clair, New Jersey. The following statement is from Dr. Randall Spaulding, superintendent of the public schools of Mont Clair:

THE PUBLIC SCHOOLS OF MONT CLAIR, NEW JERSEY.

The training furnished in these schools aims to produce an all-sided development; to furnish opportunities and stimuli suitable to all stages of child life from the nursery to the college. It is our aim to produce, not the mere mechanical power that comes from physical exercises, not the mere automatic power of an intellect that concerns itself with conventional knowledge alone, but rather that living power that uses the body and mind as instruments in the service of morally elevated sentiments and ideals. To effect this all the faculties must receive due attention, must be trained to act together harmoniously.

We begin with the kindergarten. The kindergarten is the transition stage from the nursery to the more conventional work of the primary school. If now we are able to organize the work of the kindergarten on sound principles that recognize the peculiar nature of the child, why can we not successfully meet the wants of a later age? Principles that are applicable to one age should be applicable to all ages, only with changed appliances. In the schools above referred to it has been the aim, however imperfectly realized, to base the work of all grades upon the educational principles of the earliest stage. We must, therefore, first briefly answer the question: What does the kindergarten do?

(1) The work is carefully graded to suit the growing capacity of the child. In the first gift the simplest objects are given to the child, the colored balls. He detects resemblances between these and other objects that come within the range of his experience, and so acquires clearness of ideas. The qualities that he discerns are few and simple. In the second gift he receives the hard polished sphere, the cube, and the intermediate form of the cylinder. Now he observes faces, curved and plane; differences in form and surfaces. He is now concerned more than formerly with qualities of things, and receives ideas that are not only clear but distinct. Into the third gift enter the ideas of number and use, while into the three succeeding gifts enter progressively new distinctions of form, color, and use. The faculties of invention and taste are exercised. In succeeding gifts surfaces, straight lines of equal and unequal length, curved and variable lines, together with a multitude of applications and illustrations in designing, weaving, plaiting, etc., are studied. The whole is, in short, progressive at every stage.

(2) The child's impulse to bodily activity is gratified. If this impulse is repressed, as is too often the case in our schools, an activity that is abnormal and illegitimate will be forced upon the child. Moreover, bodily activity not only relieves nervous tension, strengthens the muscles, and so conserves the physical health, but it is itself expressive of thought and feeling, and is, therefore, carefully noted by the skilful kindergartner.

(3) The kindergarten develops the child on his social or moral side. He learns that what is customary in the mutual relations of right thinking people is right. Through the games and through coöperative and associated work he learns that without kindness, justice, and truthfulness, social life is neither comfortable nor for any extended time even possible. This social development is one of the highest functions of kindergarten work, and generally distinguishes the genuine from the superficial kindergarten.

(4) The nature lessons of the kindergarten teach reverence for life. The biologist is the most tender hearted of men. Contact and study breed respect for the beautiful and wonderful forms of organic life.

(5) The kindergarten makes prominent use of that combined bodily and mental activity that we may call physio-psychological. Its aim is to coördinate the muscles with the will, expressing itself through the motor nerves. The mind habitually conceives more than its physical instruments can execute. The kindergarten seeks to coördinate the physical with the mental. To this end the hand and the eye are constantly trained together in the expression of thought. Much of the world's profoundest thought has been expressed through construction. With children construction leads most easily and naturally to expression through language.

In explaining how kindergarten principles are recognized in the Mont Clair schools I shall merely allude to the first four points, and speak more at length of the fifth; because, first, recognition of the last named principle involves to a greater or less extent a recognition of the others; and second, the above mentioned schools, if indeed they are distinguished at all from the great majority of schools, are distinguished by the attempt to carry through all grades the element of manual training that is begun in the kindergarten.

(1) In grading the schools the fact is recognized that the simplest principles of any subject may be as profitably taught to young children as advanced principles to the more mature. For instance, a child who has mastered a few simple numbers may well be taught the simplest

facts of compound numbers and percentage. By this method the lines of separation between grades are less distinct and impassable. Elasticity is gained and bright children may pass on more rapidly.

(2) The impulse to bodily activity is gratified to a certain extent by physical exercise. But the attempt is made to impress this impulse to other important uses besides the mere relief from nervous tension, as will be subsequently explained.

(3) Moral training is effected less through precept than through the example and personality of the teacher. To utilize opportunities such as are almost daily presented requires, on the part of the teacher, the highest tact and the keenest moral perception. The selection of teachers is, therefore, regarded as the most important function of the trustees and superintendent.

(4) Respect for life is inculcated by its continual study, during the first year, in domestic animals and in insects; also in plants. This observation and study of the different classes of animal life, with constant comparison of organs and functions, is carried through six years of school life, and is again resumed in a more scientific form in the ninth and tenth years. In order to secure the end sought the curiosity must be aroused, and there must be observation and contact with actual specimens, living or dead.

(5) An attempt is made to extend through nine years of school life that, to many people, most prominent feature of kindergarten work by which the senses of sight and touch and muscular control are coördinated with the mental action expressed through the will. This attempt is made in view of the fact that, without the harmonious development of the mental and physical powers before the age of 15 or 16, certain brain tracts become permanently sterilized.

In the first year, after the children have received the kindergarten gifts, they handle and observe the sphere, cube, cylinder, square, triangle, prism, and hemisphere; study their surfaces, faces, edges, and corners; construct faces and form new designs with tablets and sticks; draw the faces and invent borders; and fold corners with paper. All these solid forms and many objects based upon them are modelled in clay.

In the second year the square and triangular prism, hemisphere, ellipsoid, ovoid, cone, pyramid, and vase are modelled in clay; also many objects based upon them. Leaves are modelled in the study of the ellipse and oval. The children learn and illustrate the terms, oblong, diameter, diagonal, centre, angle, triangle, circle, ellipse, oval, base, apex, parallel, perpendicular, bisect, etc., by drawing and by folding paper. The impulse to invent is gratified through the mat weaving and paper folding in squares, triangles, and circles.

In the third year a considerable number of the more complicated geometrical plane forms are modelled in clay. Paper folding is continued in connection with original designs in pencil shading. Designs, based upon simple forms, are constructed through paper cutting. The construction of borders by the repetition of figures is introduced. Drawing of objects placed on a level with the eye is begun; the apple, tumbler, flower pot, etc., being used.

In the fourth year the children learn the use of the simplest instruments of precision, the dividers and rule. By the use of these, together with scissors and paste, the children draw the patterns and cut out and construct hollow objects suggested by a number of forms selected from both art and nature. The training of this grade consists largely of object drawing and symmetrical arrangement in design. It is believed

that object drawing can scarcely be begun too early, nor followed too persistently, both for interest and for the best eye and hand training. Every stroke of the pencil should add to the pupil's power of expressing his mental conception. Primary colors in pale tints are recognized and reproduced in flat washes.

In the fifth year the cardboard work is continued. The pupils draw, cut out, and construct with paste or mucilage eight or nine geometric forms of three dimensions; also in a similar manner other objects such as a house, steps, cross, etc. These forms are bound and covered with colored paper. Knife work is also continued. Then pupils cut several geometric forms, and in addition such forms as the crescent, star, knife, and pointer; also a variety of leaves. About a dozen pieces of incipient joinery are constructed, such as the square, try-square, T-square, triangle, hexagon, and ladder, of which the parts are shaped and glued together. The drawing comprises object drawing from a variety of solid forms, and design by symmetry and repetition. Flat washes are laid in tones and tints of the primary colors; combinations are also made to form secondary colors.

In the sixth year the pupils do advanced work in clay modelling, using the so-called "building up" process. The clay is compacted into a mass the form of which approximates that of the object to be modelled; the parts are then cut away until the finished form remains. The work in modelling comprises conventional and architectural forms, animal forms, and studies of the human body. Regular practice in drawing is continued, and comprises the drawing of both conventional and natural objects, projection preparatory to the making of working drawings, and the invention of curved and straight line designs for borders and surfaces.

In the seventh year a distinction is made between the sexes. The boys are trained in the shop in the use of joiner's tools, passing through a course of some twenty carefully graded exercises in joinery. These exercises are planned with a view to giving the best hand training. The girls during this year practise sewing, learning the various stitches and how to apply them in the making of garments. Object drawing is continued; working drawings are made for use in the shop; designs are invented with curved elements, and the backgrounds are inked in with the pencil brush.

In the eighth year the boys are trained in wood carving. This course embraces the use of tools, plane and surface carving, diaper carving, horizontal and vertical lines of decoration, incised model carving, and relief work. The girls during this year have a course of practical lessons in domestic economy, including the cooking of vegetables, soups, bread, meats, entrées, cake, dessert, fish, salads, cereals, eggs, etc. Groups of objects are drawn and shaded. Many natural objects are introduced, and special attention is given to leaves and flowers. Designs for wood carving are made; also more elaborate designs with inked backgrounds.

In the ninth year the boys are trained in the use of machine tools. This course includes wood turning, lathe work in metal, vise work, forging, etc. The girls during this year receive the same training in wood carving that the boys received in the previous year. In drawing some eight or nine groups of solid forms are drawn and shaded with pencil. Drawings are also made with charcoal from casts and from natural objects.

In the schools under consideration special exercises for the harmonious training of the bodily and mental powers cease with entrance into the

high school. After the training already described special work in this direction, while of course desirable, would seem to be not altogether essential. It might, however, as an optional, be extended in more technical forms.

The work above described is by no means set forth as an ideal course of study. It is, like all quests for improvement, an experiment; one, however, that has been for many years so fruitful of good results that its continuance is justified. The harmonious training of the bodily and mental powers develops the practical judgment, strengthens the executive faculties, and inculcates sympathy with that industrialism that is the most distinguishing characteristic of our time.

Action and things are both important stimuli to intelligence. The lack of activity expended upon material objects accounts for much of the so-called indolence of school children. A wisely directed activity in the manipulation of tools leads to increased mental and moral activity. Teachers recognize this; but the increased expense and the greater knowledge and enterprise that would be demanded of them stand in the way of the best results.

PUBLIC SCHOOLS OF THE DISTRICT OF COLUMBIA.

Similar in its aims and broader in its scope is the school system of the District of Columbia. Here manual training instruction does not end with the completion of the grammar school curriculum, but continues as an elective study throughout the high school course.

The kindergarten, however, is not yet recognized as a distinct grade of the Washington public schools, though its special methods and appliances have been appropriated and utilized in the lower grades of the primary department, so that, practically, the entire educational system of the city is permeated with the Froebelian idea.

In the report to the board of trustees of public schools of the District of Columbia for the year ending June 30, 1891, Superintendent Powell writes:

For years many employments developed from those of the kindergarten have been a part of the school work of the primary grades. For a longer time drawing has been an important part of the work of all grades of school. A few years since manual training shops were provided for the training of boys of the seventh and eighth grades in the use of tools, and cooking schools were provided for the girls of the same two grades. About the same time it was decided to teach the girls of the lower grade schools to sew. More recently we have established two shops, one in the third division and one in the fourth division, in which the girls of the sixth grade are taught cutting and fitting.

Our conditions below the high schools, resulting from facts stated above, are presented more clearly by the following: The children of the first and second grades are given the employments of the kindergarten; the girls of the third, fourth, and fifth grades are taught sewing (one hour per week); some of the girls of the sixth grades are taught cutting and fitting (two hours per week), while the other girls of the grade are taught sewing (one hour per week); the girls of the seventh and eighth grades are taught cooking (two hours per week); the boys of the seventh and eighth grades are taught bench work (two hours per

week); the pupils of all grades are taught drawing (one hour and twenty minutes to two and a half hours or more per week).

* * * * * * *

Since the beginning of manual training exercises in our schools, therefore, efforts have been made to arrange some practical lines of hand work that should begin in the first primary grade and lead sequentially to the employments of the tool laboratories of the seventh and eighth grades for the boys, and that it should be equally profitable to the girls who would be instructed in cooking when reaching the same grades.

Ten teachers were employed in the cooking laboratories which were reported as in operation during the year; there were 2,073 pupils in attendance. Nine sewing teachers were employed to give instruction in the various schools; 5,902 pupils were taught in this branch. Of the seventh and eighth grade pupils 1,284 received instruction in the seven bench laboratories of the city.

Details of the courses of study and practice in Washington schools (of all grades from the first to the eighth) are given in Superintendent Powell's report. We transcribe that portion of the report which describes the kindergarten occupations of the first and second grades and shows how the more advanced exercises of the manual training course in the upper primary schools have been evolved from kindergarten principles, forming a consistent and homogeneous system of education, free from hiatuses and exempt from abrupt transitions.

Following are the details of the instruction in the first and second years:

Tools and materials in the hands of the children: Clay, colored sticks, geometric tablets, colored paper, mucilage, pencil, and blank tablets for drawing.

Clay.—Children model in clay the sphere, hemisphere, cube, square, prism, cylinder, right angled triangular prism, ellipsoid, ovoid, equilateral triangular prism, cone, and pyramid, studying the forms from wooden models through the senses of sight and touch.

In connection with each geometric solid modelled modifications of it are modelled, such as are found in fruits, vegetables, bottles, and pottery forms (apples, tomatoes, lemons, pears, nuts, bowls, teapots, sugar bowls, etc.), objects that can be brought into the school room by the children or by the teacher. Nearly all the objects used are so easily procured that every child can have a model on his desk, which he studies and endeavors to imitate. The number of objects the pupil may imitate in clay is limited only by the time that may be given to the work.

Tablets.—From these solids the child passes to the study of planes, using tablets which he builds around his solids, forming conceptions of the square, oblong, triangular, and circular planes as parts or properties of the solids. He also uses these tablets for inventing ornamental arrangements, as borders and rosettes. In connection with these planes he draws the forms of objects, the essentials of which can be given in drawings by the representation of one plane, as fans, envelopes, leaves, etc.

Sticks.—From the planes the child passes to the study of edges, using sticks of different lengths for construction. He first builds around the

tablets, obtaining ideas of edges, then uses the sticks to gain conceptions of position and direction, as vertical, horizontal, and oblique, parallel, and at angles. He uses them also for the division of lines by matching a long stick with short sticks of equal lengths, and for ornamental arrangements in borders and around a centre. Such constructions are drawn full size.

Paper.—Colored paper is next given to the child with which he is taught to fold all the right line geometric planes and ornamental combinations of them representing borders and rosettes.

Color.—The colors of the paper used are, in the first year, two tints each of normal red, yellow, and blue; in the second year two tints each of orange, green, and violet. These colored forms and combinations are expressed by the child in drawings. They should be rendered by washes of water color. This has been done in some schools. It will be done in all whenever practical difficulties can be surmounted.

In the study of color the children study the spectrum colors, using colored paper designed for this purpose, twelve colors being used—red, red orange, orange, yellow orange, yellow, yellow green, green, blue green, blue, blue violet, violet, red violet. They are led to arrange these in their true relations by taking in succession the yellow, red, blue, orange, green, and violet, and selecting the nearest related hues until they are able to arrange them in true order. They also learn to recognize and arrange the tints of red, yellow, blue, orange, and violet. They are led to look for these colors in other materials and in nature, especially in the flowers and leaves that are brought into the school room in great abundance for use in connection with other subjects, number, and language. The object of this work is to cultivate the color sense.

Position and drill.—The child is trained to keep the body in right position for healthful activity, and is drilled in pencil holding and pencil movements.

Language.—In all this work special attention is given to language, both as a means of fixing conception and for the purpose of expressing it.

In the lower grades most time and effort are given to the acquisition of conceptions and to the development of the power of acquiring them through the senses of sight and touch aided by language, and to the handling of materials. * * * Power of selection is developed and skill in arrangement is acquired by the grouping of forms, in the arrangement of tablets, sticks, and folded papers, with a definite thought in mind, as of making a pattern for a border or a rosette.

The child is led out from his confused and disorderly ideas of arrangement to see the beauty of orderly arrangement, out from his crude ideas of color combinations to the beauty of harmony.

It will be observed by reference to the course that both natural forms and art forms are presented to the child for study, it being desirable that neither should be presented to the exclusion of the other. If he gets his conceptions of form from nature alone he will miss the benefit derived from the great conceptions in architecture and decoration given us by masters, whereas if he studies art alone he is liable to be a servile imitator only.

Following are the details of the instruction in the third and fourth years:

Tools and materials in the hands of the children: Clay, colored paper, mucilage, pencil and blank tablets for drawing, and scissors.

Clay.—The same geometric models are used in the third and fourth years as in the first and second years, the sphere, hemisphere, cube, square prism, cylinder, triangular prism in the third year; the sphere, ellipsoid, ovoid, equilateral triangular prism, cone, and pyramid in the fourth year. The forms used for models are larger than those used by the children of the first and second grades, thus requiring greater judgment and more skill in construction. In the study of both the natural forms and the art forms more careful observation and greater skill in rendering is required. For example, while in the first year the clay form of the apple might represent merely an apple as distinguished from an orange, in the fourth year it should represent the individual apple on the desk of the child.

In the third year more fruit and vegetables are modelled than art forms; in the fourth year more art forms are made the objects imitated, being principally vases, pitchers, and other pottery forms. In the fourth year one or more objects are modelled of definite sizes, the specifications being given by the teacher. Heretofore the pupil has been expected to imitate only in size as well as in shape. Now more exact results are asked.

Object drawing.—The forms after being made in clay are represented by outline drawings. Fruits and vegetables are represented singly in the third grade, whereas in the fourth they are represented in groups.

The geometric solids are represented only by geometric drawings, giving top, end, and side views.

Paper folding and cutting.—(1) Scissors are now used for cutting forms. An especial study of units is made to discover possible modifications of them by a change of lines, change of proportions, or by the adoption of a motive from nature, as a leaf or the petal of a flower, each of which is cut. (2) A study is made of the geometric forms, the square, right angled oblong, rhomb, and triangle, in the third year; whereas in the fourth year are studied the circle, pentagon, hexagon, and octagon. Each construction is cut. (3) A study of the division of geometric forms is made by use of diameters and diagonals. (4) A study of spaces or fields thus obtained is made, after which the selection and adaptation of a unit to fill each field is made, each of which is cut. (5) Borders are invented and cut. The variety of these is almost without limit. All arrangements are cut and pasted, after which the combinations are represented by drawings, as in the first and second years.

A complete development of the subject leads to representation by washes of water color. This has been done in many of the schools with excellent results. As difficulties of procuring and caring for materials are eliminated the work will be done in all the schools.

Color.—As this is the first year we have been able to procure the spectrum colors in suitable materials, the first and second year course will be given in these grades.

Color lessons have been given for two years in the first four grades in the recognition of red, yellow, blue, and their tints, illustrating by the use of pigments the results obtained by combining these.

An optional course in water color has also been in use for two years, in the third and fourth grades, which has been very successful when the materials could be procured to carry it out.

The course is, in the third grade, washing tints of primaries in oblongs 3 by 5; coloring of decorative arrangements around a centre and of borders.

Fourth grade: Mixing secondary colors from primaries; washing in

tints of secondaries; coloring of decorative arrangements in tints of secondaries; mixing other hues of the spectrum, as red orange, yellow orange.

Drill.—Drills in the use of the pencil are continued throughout these years. The making of the circle, ellipse, and ovoid, with curves derived from them, gradually take the place of making straight lines in these drill exercises.

Language work continues, the vocabulary being constantly enlarged as new conceptions of form, position, and color are obtained by the child. It will be observed that as conceptions of form are increased more attention is given to the development of the power of selection and arrangement. This is seen in the grouping of fruits and vegetables for object drawing, in the adaptation of units to space in the selection of suitable curves to modify such units, and, lastly, in the use of natural forms by seeking for the type form, deciding which type form is best adapted to the space and rejecting details that interfere with the conception of this form as adapted.

The child should be early led to apply the law of selection to what he does, which is discrimination between the principal or the essential and the subordinate or the non-essential. The artisan, the artist, and the author alike must, to succeed, skilfully apply the law of selection. It distinguishes between the necessary and the accidental, between the basal elements and those that are ornamental, auxiliary, or complementary. The beginning of power to select appropriately marks the birth of the artistic sense. Its correlated applications are the beginnings of judgment in other affairs.

In the four remaining years of the grades below the high school this work is continued without interruption, thus securing, in the words of Superintendent Powell, "the unity of our manual training from the first primary grade through and including the tool laboratories."

Principal F. R. Lane, of the Washington central high school, writes as follows concerning the status of manual training in his department for the year ending June 30, 1891:

Number of pupils—first year, 108; second year, 44; third year, 30; time, two hours a week. The plan followed in the high school manual training work is to supplement the course of joint making, carpentry, and cabinetmaking of the seventh and eighth grades of the grammar schools by a course of draughting and wood turning in the first year; iron and steel turning, forging, and draughting in the second year; chipping and filing, machine construction, and draughting in the third year.

Manual training has been instituted, with signal success, also in the colored schools of the district. Mr. J. H. Hill, director of manual training, reports that during the year ending June 30, 1891, the number of pupils in the colored manual training school was 606—88 in the metal shop and 518 in the three carpenter shops. He says:

The course of instruction in this work has been followed as heretofore, beginning by squaring and trimming a piece of lumber 3 inches wide, $\frac{7}{8}$ of an inch thick, and 8 inches long, mortising and tenoning, dovetailing and inlaying, moulding by hand O. G. crown, O. G. and fillet, cove and round, cove and half-round, and nosing. The lessons included instructions on the nature and use of tools; instruction and practice in shop drawing; elementary work with plane, chisel, and saw; different

kinds of joints, timber, splices, cross-joints, mortise and tenon, mitre and frame work; different kinds of joints used in cabinetmaking, light cabinet work; examples in building framing, roof trusses, and making small articles of furniture.

A course in wood turning extended through a part of the second and third year's work. The lessons comprised—first, nature and use of lathe and tools, plain and straight turning, caliper work to different diameters and lengths, simple and compound curves, screw plates and chuck work, hollow and spherical turning; second, a variety of examples of whole and split patent core work, giving the pupils practice in forming irregular shapes in wood with lathe and carving tools, as well as familiarity with the nature and use of patterns for moulding.

The metal shop contains six forges and five lathes. The first lessons are given in forge work, welding, and the making of iron hooks, hasps, and staples; hardening and tempering of steel, vise work, chipping and filing in vise benches, instruction on lathe and drill chucks, drill reamers, taps and dies, gauges, files, cutting tools, and special appliances for machinery, moulding and casting in soft metal.

* * * * * * *

Lectures were also given during the year on various subjects connected with machine work in metal, such as forms, constructions, use of machines and cutting tools, gearing, gauge, screw threads. Some pieces of construction work were given to the classes. All drawings, with dimensions required, were put on the blackboard and then copied on paper by the pupils; thus each one works from his own drawing. This was supplemented wherever necessary by the actual construction of the lesson by the teacher before the class and by inspection and direction at the bench.

During the same year 567 pupils were enrolled in the cooking classes of the colored schools. Of this number 265 were from the seventh grade, 194 from the eighth grade, and 108 from the high school. Girls in the grades from the third to the sixth, inclusive, are thoroughly taught in the art of needlework, as in the same grades of the white schools.

Summing up the advantages of manual instruction Superintendent Powell says the course "complements or supplements other studies of the school course in such ways as to be most valuable as auxiliary to them."

CHAPTER XII.

MANUAL TRAINING IN CONJUNCTION WITH BOOK WORK.

CHAPTER XII.

MANUAL TRAINING IN CONJUNCTION WITH BOOK WORK.

Much has been said by the friends of manual and trade training relative to the proportionate time which can be advantageously expended in such training in conjunction with academic work. The ardent friends of industrial education, using the term broadly, insist upon it that, with a reasonable time devoted to manual training or trade instruction, there is not only no loss in book work, but a positive gain, both in amount and in comprehension of what is studied; that a student workman has his mental faculties sharpened by his hand work, and that he comprehends all the more quickly the principles of mathematics, for instance, through his training in physical and mechanical directions. Largely these views are matters of opinion; so in this investigation relating to industrial education an effort was made to secure some positive information upon so interesting a feature of the question. Little was accomplished, of course, but yet enough to indicate most conclusively the real facts or the real conclusions which may be arrived at by those studying the subject. To secure this information Dr. Henry H. Belfield, director of the Chicago Manual Training School, who was about visiting Europe in the interest of his school, was invited to study the subject of this chapter. His instructions, contained in a letter of November 9, 1891, were to secure facts which would "show whether joint training, mental and manual, enables the student to become as proficient as others, or more proficient, as the case may be, in the ordinary academic studies of a school equal to the grade of our American high school." He was urged to make diligent inquiry whether evidence on this point existed, and if so, to secure it. On his return from Europe Dr. Belfield, under date of May 7, 1892, submitted the following report:

Without attempting a description of the educational systems of Europe, or even of the European technical schools, either of which would throw considerable light on the difficulties attending such an investigation, I may say, briefly, that I was met at the outset with such facts as these:

The English board schools, which are closely analogous to our public schools, include no such schools as our American high schools, since they provide instruction for boys and girls through what are called the "seven standards," which correspond in general with the eight grades of our primary and grammar schools, and nothing beyond of any consequence; that is, the instruction stops where our high schools begin. The seventh standard, the highest grade, is completed by the pupils at an age too immature for secondary, or high school, instruction. To

quote the words of Mr. H. J. Gibbs, an official of the educational department of the English government, "At 12 years of age the school life of most of the children is over." I was therefore obliged to look for pupils corresponding in grade to the American high school pupil in such schools as the merchant tailors', Saint Paul's, and Christ's Hospital, in which there is no manual training or shop work of any kind, and in the Polytechnic, the People's Palace, and the goldsmiths' school of London, the Liverpool School of Science and Technology, and the technical institute of Manchester. The five schools last named and a few others like them possess well equipped shops for pupils' use; but the conditions are generally very different from those existing in the American manual training schools. In the latter the tool instruction is given for the purpose of general culture, and the teaching of any particular trade or trades carefully avoided. In the English schools, on the contrary, the shop instruction is avowedly trade teaching, the pupils generally being youths who are serving apprenticeships and young men already working at their trades and who attend the schools in order to obtain greater technical skill in their chosen trades. This statement is especially true of the evening classes which constitute the large majority of the pupils attending these schools. However, manual training has been introduced into some of the seven standards, and I am able to present you some very striking testimony from these grades of pupils in the general line of your instructions.

On the continent I found conditions resembling those in England more than the conditions in our own country, yet different from both. While the greater part of tool instruction is in the direct line of trade teaching, I found some shop work with an educational motive. For instance, in the communal school in the rue Tournefort, Paris, the manual training is of this character; but the boys are less than 13 years of age, and the studies are what we would call primary and grammar school studies.

As a typical French trade school I would mention the *École Municipale Diderot*, in which the pupils are about the age of American high school pupils. Here the boys work four and a half hours daily in the shops for the first two years, and devote four hours daily to academic work. I could not obtain any evidence of the character desired by you concerning this school, but I have abundant reason for believing that the amount of academic work done by the pupils of this school, whose time is so largely occupied by shop work, can not possibly equal that done by boys of the same age who can devote all their time to study. Another typical school is the *École Centrale* for civil and mechanical engineering and elementary architecture. The students are from 18 to 21 years of age. The school is provided with excellent chemical and physical laboratories, but no shops.

The school for mechanical engineers in the Technikum at Winterthur, near Zurich, is designed for the education of foremen and superintendents of machine shops. It demands a three years' apprenticeship in a machine shop, or its equivalent, before entrance. This has rendered its entering classes 18 or 19 years of age. To provide an opportunity for this preliminary apprenticeship, and at the same time to enable the boys to continue their studies, and thus reduce the age of entering, a school corresponding very closely to the American manual training school was established four years ago in Winterthur. To this school boys are admitted at 14 years of age, and work five hours daily in the shop and one hour daily in the drawing room. Here, again, the time devoted to shop work is more than double that given to shop work in the American manual training school. Another important feature

in which it differs from the American school is this, that the shop is a manufacturing establishment, its output being articles designed for sale. This is diametrically opposed to the American idea which seeks mental development by a series of carefully graded exercises, and scrupulously avoids the manufacture of salable articles, as calculated to secure technical skill merely.

The magnificent technical high school of Berlin also demands a preliminary apprenticeship. As a result its students are older than those in similar American schools. A graduate of an American manual training school, whom I met in Berlin, was admitted to the second semester of the first year of the Berlin technical school on the basis of the work done in the American school. He was several years younger than the youngest of his German classmates, since he had combined his shop instruction with his academic preparation. That this young man could enter the Berlin technical high school several years younger than his classmates and half a year in advance, and maintain a good standing, seems to indicate that he had done essentially the same work as that done by his mates in two or three years less time.

The conclusion which I have drawn from all the facts that I was able to collect is this: That the combination of mental and manual work does not diminish the amount of purely academic work done, provided the manual work is held properly in abeyance. What the proper amount of manual work may be will depend on several circumstances, and may, perhaps, be inferred from the facts given below. These facts will certainly justify one or two hours per day, according to the age of the pupils and the character of the work. The statement just made is based principally on the experience of schools lower in grade than the American high school, for the reasons already given. The following are some of the typical facts which have led me to this conclusion:

Liverpool.—My authority for the following statements in regard to the Liverpool schools is Mr. C. Foster, a government inspector of schools, who kindly submitted to be interviewed.

Two years ago the school board introduced hand tool work in wood into several schools as an experiment. The experiment succeeded so well that this work is now compulsory in all Liverpool schools for boys under the control of the school board. The instruction is wholly pedagogic, the pupil making simple exercises to his own drawings. No trade is taught. The amount of academic work done has not been decreased by the introduction of drawing and tool work. There is an evident development of mental strength, traceable directly to the manual work; discipline is easier, and the boys are more interested in their school work. The inspector appointed by the imperial government examines the drawings and wood work as well as the academic work. (This is true of Liverpool and Manchester schools, and perhaps a few others, but is not general throughout the United Kingdom. I was informed by several of the government officials in London that the northern cities were in advance of others in this style of school work.) During the time in which this wood work was practised in some of the Liverpool schools and not in others the schools having the tool work passed "at least as good examinations" as those which did not have it. I regret that I can not state positively the number of hours per week given to shop work in these boys' schools.

For many years sewing has been taught in the girls' schools in Liverpool; a few years ago cooking was added, and now four and one-half hours per week are given to these two subjects, viz., sewing (including

dressmaking in the higher grades) and cooking. The academic work has lately been increased and a higher standard of scholarship secured.

Manchester.—The secretary of the Manchester technical institute, Mr. J. H. Reynolds, is my authority for statements concerning the institute which is equipped with carpenter shop, forge room, foundery (for lead castings), machine shop, plumbing shop, drawing and clay modelling rooms, and a very fine and complete weaving outfit. Most of the students are young men who work during the day and attend the institute in the evening only. There is, however, a class of about forty boys, from 14 to 15 years of age, who are day pupils, and who take wood work and drawing in addition to the regular academic work. Mr. Reynolds is positive, not only that the shop work has a pedagogic value, but that it stimulates to more and better academic work.

I visited the Cheatham Hospital and Library, a "blue coat" school, limited to 100 boys from 8 to 14 years of age, who are instructed in the usual studies, with drawing and wood work added. The head master, Mr. Brown, informed me that before the introduction of manual training 93 per cent. of his candidates passed the government examination, but that since the introduction of manual training not a candidate had failed. He is enthusiastically in favor of manual training as a help to mental discipline.

London.—No report, however brief, on education in London would be complete without at least a reference to the Polytechnic, the People's Palace, and their young rival, the goldsmiths' school, at New Cross. These three schools are equipped with shops. The majority of the students are in the evening classes, but the work is of such a character that it does not throw any light on the question under consideration.

Board schools.—In the year 1886 the experiment of teaching wood work was made in six rooms in the board schools of London. This experiment was so successful that instruction in wood work is now given, or soon will be, in all the 420 schools in London. Boys who have had instruction in carpentry have passed equally well in their other studies with those who have confined their attention to the usual branches. My authority here is Sir Philip Magnus, from whom, as well as from Sir Philip Cundliffe Owen, Mr. Gilbert Redgrave, and Mr. Henry J. Gibbs, I received the most courteous treatment.

Mr. Baxter, in charge of wood work in the London board schools, informed me that 1,000 teachers are now receiving instruction in wood work and 3,000 in cardboard, clay modelling, etc., in London, preparatory to teaching those subjects, and that a similar condition exists throughout England. Mr. Baxter and Mr. Charles Woods, his assistant, were both emphatic in stating as a result of the experiment in London that the wood work does not diminish the amount of academic work, and that it has an educational value of its own. They gave several instances of head masters of London schools who had at first violently opposed the introduction of wood work into their respective schools, but who became its firm friends on witnessing its beneficial effects.

The jealous care with which an English head master guards the curriculum of his school and the energy with which he instinctively resists the introduction of any subject having a tendency to reduce the examination averages of his pupils are apparent when it is remembered that the amount of government money—the "grant" as it is called—depends upon his pupils' "marks" in the government examinations. It is a common occurrence to hear English teachers boast of the "earning" capacity of particular pupils or classes. The People's Palace

charges double fees to pupils who do not earn government grants. That the English schoolmaster, therefore, should consider the time taken from arithmetic and grammar, which are money earning studies, to be given to tool work, which is not yet a money earning subject, as so much time wasted was most natural; that after a fair trial he should welcome the tool work as beneficial is positive proof that, in his opinion, the tool work has not lowered his pupils' examination averages—in other words, that the pupils accomplish as much academic work, at least, with the tool work as without it.

One of the most interesting schools visited was a trade school in Vienna, of which Herr Exner is the director. This school is peculiar in having larger day than night classes. It is doing much admirable work, and its graduates find ready employment at good wages. Of their eight hours its students spend four in the shop. Dr. Exner, who is also a member of the Austrian parliament, and a man of eminent ability and great influence, maintains that four hours of shop work and four hours of study make a stronger man than eight hours of study, but that the time thus taken from study necessarily reduces the amount of academic work done by his students. And this is, I think, in accord with the experience of all who have had to do with schools in which the manual work occupies so large a part of the student's time. But it is also the opinion of those with whom I have come in contact, who have been connected with schools in which the time given to tool work is considerably less, that a moderate amount of manual training not only does not reduce the academic work done, but that it stimulates the student to greater effort and more successful study. This statement is true in regard to every city in which I found the conditions permitting a comparison to be made. In most of the cities visited, however, the absence of manual training, or the great attention devoted to it, rendered it impossible for me to draw any conclusions on the subject in hand.

On receiving the foregoing statement from Dr. Belfield it was deemed best to pursue the same line of inquiry, but on a more clearly defined basis, in this country, and after a conference with him by the Commissioner of Labor he was urged to undertake the inquiry through correspondence. Dr. Belfield was so well known to all the principals of manual training schools and the presidents of technological institutions in this country that he seemed, with his recent experience in Europe, to be well equipped for the study. In order to carry this inquiry on systematically Dr. Belfield issued a circular, of which the following is a copy:

CHICAGO, *May 30, 1892.*

——— ———

DEAR SIR: At the request of the Hon. Carroll D. Wright, United States Commissioner of Labor, I am endeavoring to collect some data from the manual training schools of this country, on the relation of manual to academic work. You will greatly oblige by mailing me answers to the following queries concerning your institution.

Very respectfully,

———,

Director of the Chicago Manual Training School.

1. How many hours per day, or per week, are given by each pupil to shop work (excluding drawing)?

2. How many hours to drawing?
3. What is the character of the shop work for boys? For girls?
4. Is shop work compulsory on all pupils?
5. What is the effect of shop work on the amount and character of the pupil's academic work: 1. In mathematics? 2. In science? 3. In literature? 4. In general?

I wish to know whether the pupil who takes manual training, in addition to the regular academic work, does as much academic work, and does it as well, as the pupil who has the academic work only.

6. Do you perceive any effect of shop work on the mind or character of the pupil different from the effect of the academic work? If so, what? and how much?
7. What is the maximum time which, in your judgment, can be devoted to shop work without injury to academic work?
8. To what grade of pupils (primary, grammar, or high school) do the answers to the foregoing questions refer?
9. Kindly add whatever remarks you may think pertinent.

The results of Dr. Belfield's inquiry are best stated by himself in a report made to the Department under date of October 13, 1892, as follows:

I have the honor to submit the following report in accordance with your instructions given in May last. It was your wish that I should ascertain the effect on academic studies of the manual work of the character usually prescribed in schools known as manual training schools, particularly whether the addition of such hand work to the usual curriculum interferes with the progress of the pupil in his ordinary studies. In furtherance of this object I prepared a circular (copy of which is enclosed) and sent it to the presidents of technological schools, universities having engineering departments, to city superintendents of public schools in which manual training exists, and to principals and directors of manual training schools and of high schools including manual training in their work. In order to secure unbiased reports I addressed the circular, whenever possible, not to the person immediately in charge of the manual training, but to some official of superior rank, whose position enabled him to perceive more clearly and to judge more dispassionately the effect of manual training on the other studies. For instance, I addressed a circular, not to the principal of the Philadelphia Manual Training School, but to the superintendent of the Philadelphia public schools; and this expedient will explain the absence from this report of communications from several men engaged in this department of education. In some cases, however, my circular was referred to, and answered by, the teacher directly in charge of the manual training department.

The circular was prepared specially for schools of grammar and high school grade, in which manual training is usually added to the regular academic curriculum. It was, however, as has been stated, sent to technological schools, also, although it was well understood by the writer that some of the inquiries were not pertinent to the work done in such institutions, in order to make the results of my investigations as broad as possible.

To the circulars sent forty-two replies were received, the tabulated results of which are given on separate sheets which accompany this letter. Your attention is invited especially to the replies to questions numbered 5 and 6, as embodying the information particularly desired by you.

The general testimony of the replies is that pupils taking manual training as a part of their school work, in the regular school hours, accomplish as much academic work as, or more than, those pupils who devote the same number of hours to school work without the manual training. While a few of the officials reporting are unable to say more than that they perceive no reduction in the quantity or quality of academic work done, the large majority report more and better academic work when the hand work is added. It is noticeable that as a general rule the larger the amount of time given to manual training the more marked are the beneficial results.

The testimony in regard to the comparative quantity and quality of academic work done by those who do, and those who do not, take the hand work is, I think, most valuable when given by those reporting from schools in which the hand work is optional. In such schools, where each class is composed of pupils, some of whom take the manual training and some not, but to all of whom the same lessons in academic work are assigned, the opportunity for comparison is remarkably good. Such a school as the Toledo high school affords the opportunity, and the present superintendent of the Toledo schools, who makes the report, has had unusual facilities for studying this matter, since he was the principal of the Toledo high school when manual training was added to its course. His remarks, as well as those of Dr. Woodward of Saint Louis, Mr. Richards of the Pratt Institute, Mr. Stanwood of Cincinnati, and President Fetterolf of Girard College, and others, are worthy of attention, coming from careful observers who have given years to the study of the subject.

The reports from the schools are arranged in the alphabetical order of states, the grammar and high schools in one class, the universities and technological schools in another.

The results of Dr. Belfield's inquiries, presented in tabular form, as indicated in the report just given, are of great value. The testimony is universal from the leading training schools in this country as to the time which can be devoted to shop work without injury to academic work, and upon the effect of manual training on the amount and character of the pupil's academic work in various directions. These results are shown in the following tabulated statement:

MANUAL TRAINING IN GRAMMAR AND HIGH SCHOOLS.

Marginal number.	Name of institution.	Name and official title of person reporting.	Hours per week in—		Character of shop work for—	
			Shop work.	Drawing.	Boys.	Girls.
1	Cogswell Polytechnic College, San Francisco, California.	Elisha Brooks, principal.	7½	3¾	Carpentry, turning, forging.	Modelling, carving.
2	Public schools, Washington, District of Columbia.	W. B. Powell, superintendent.	2	2	Wood, metal.	Sewing, cooking.
3	Atlanta University, Atlanta, Georgia.	Horace Bumstead, president.	7½	1½	Bench, lathe, forge, mechanical drawing.	Sewing, cooking, laundry, nursing.
4	English high and manual training school, Chicago, Illinois.	Albert G. Lane, superintendent.	10	5	Wood, forge, foundery, machine shop.	.....
5	Grammar schools, Chicago, Illinois.	Albert G. Lane, superintendent.	2	1½	Wood.....	.....
6	Chicago Manual Training School, Chicago, Illinois.	Henry H. Belfield, director.	10	5	Wood, foundery, forge, machine shop.	.....
7	High school, La Grange, Illinois.	Henry W. Thurston, principal.	3	2	Wood.....	.....
8	Manual training school, Moline, Illinois.	O. Curtis Wicks, instructor in manual work.	2½	2½	Wood.....	Carving, cooking.
9	Manual training high school, Louisville, Kentucky.	H. F. A. Kleinschmidt, principal.	10	5	Wood, foundery, forge, machine shop, sheet metal.	.....
10	Baltimore Manual Training School, Baltimore, Maryland.	A. Newton Ebaugh, professor of higher mathematics.	c 10	5	Wood, forge, machine shop, sheet metal.	.....
11	McDonogh School, McDonogh, Maryland.	Duncan C. Lyle, principal.	8 to 9	3	Wood, moulding, printing.	.....
12	High school, Springfield, Massachusetts.	Charles Jacobus, supervisor of manual training.	7½	3¾	Wood, forge, foundery, machine shop.	.....
13	Public schools, Waltham, Massachusetts.	——— ———, superintendent.	4	2	Wood, forge.	.....
14	Public schools, Winchester, Massachusetts.	E. Hunt, superintendent.	2	1	Wood.....	.....
15	High school, Minneapolis, Minnesota.	John Morris, supervisor.	6¾	3½	Wood, metal.	.....
16	High school, Saint Paul, Minnesota.	Albert A. Gordon, jr., supervisor.	5	2½	Wood, forge, machine shop.	.....

a Below high school.
b In a regular manual training school.

MANUAL TRAINING IN GRAMMAR AND HIGH SCHOOLS.

Shop work compulsory to all.	Effect of shop work on the—		Maximum hours which can be devoted to shop work without injury to academic work.	Grade of pupils referred to.	Marginal number.
	Amount and character of academic work in mathematics, science, literature, and in general.	Mind and character different from the effect of academic work.			
Yes..	Makes the mind brighter and keener in mathematics and science. The student is more interested in the general work of the school.	More self-reliant. No suspicion that work is degrading.	2 per day.....	High school.	1
(a)	Just the same and just as good ...	.....	2 to 4 per week ...	.....	2
Yes..	We see no loss accruing to the academic work either in quantity or quality. I doubt if shop work had better be prolonged far into the higher courses where time is a more important element.	I can not honestly say that I see it; yet I believe it exists and is a beneficial effect.	1½ per day	Three upper grades of grammar; 3 classes college preparatory.	3
Yes..	All being required to take the full course we can not compare.	Not ascertained...	10 per week.....	High school.	4
No...	Intensifies interest in all work, and does academic work as well.	Develops closer application.	2 per week	Seventh and eighth grammar.	5
Yes..	In mathematics and science more and better work; in literature less. The general average more and better.	Develops the will power and the judgment with much earnestness and readiness.	7½ to 10 per week .	High school.	6
No...	No effect. No academic work is omitted for sake of manual training.	Helps self-control and adds to interest in all work; increases enthusiasm.	2 per day	High school.	7
No...	School open too short a time to notice effect.	A decided effect in dignity and independence.	1½ per day	High school.	8
Yes..	The school is new. As much academic work, and as well done, as in other high schools.	Makes them more self-reliant.	b 2 per day	High school.	9
Yes..	More analytic power. Cultivates powers of observation. Opens field for expression.	Cultivates independent investigation.	10 per week.....	Upper grammar and high school.	10
No...	The pupil who takes manual training in addition to the regular academic work does more academic work and does it better than the pupil who has the academic work only.	I am convinced the effect is good.	10 per week.....	Grammar and high school.	11
No...	No difference perceptible; fully equal and possibly more earnestly done.	A little more manliness, good judgment, and a better eye for business.	7½ per week.....	High school.	12
No...	School in operation one year only. Can not determine.	.....	4 per week.....	Eighth and ninth grammar.	13
No...	Good in all.....	More thoughtful..	2 to 3 per week...	Eighth and ninth grammar, and high school.	14
No...	A help rather than a hindrance..	Yes. Refers to article published.	10 per week.....	High school.	15
No...	In mathematics and science, increased amount and higher character.	Yes. The mind is broadened and made more capable of understanding a logical course of reasoning.	7½ per week.....	High school.	16

a Five in lower classes.

MANUAL TRAINING IN GRAMMAR AND HIGH SCHOOLS—Continued.

Marginal number.	Name of institution.	Name and official title of person reporting.	Hours per week in—		Character of shop work for—	
			Shop work.	Drawing.	Boys.	Girls.
1	Saint Louis Manual Training School, Saint Louis, Missouri.	C. M. Woodward, director.	10	5	Wood, foundery, forge, machine shop.	.....
2	Public schools, Concord, New Hampshire.	L. J. Rundlett, superintendent.	2	1	Wood.....	Sewing...
3	Public schools, Mont Clair, New Jersey.	J. H. Love, clerk board of education.	2	2	Wood, metal.	Cooking, sewing, modelling, wood carving.
4	Public schools, Orange, New Jersey.	Usher W. Cutts, superintendent.	1	1	Wood.....	.....
5	Public schools, Vineland, New Jersey.	J. P. Bennett, superintendent.	1 to 3	1 to 1½	Wood....	Sewing...
6	High School, Albany, New York.	Oscar D. Robinson, principal.	1½	¾	Wood.....	Sloid .....
7	Public schools, Jamestown, New York.	Rovillus R. Rogers, superintendent.	1½	¾	Wood.....	Sewing, etc.

MANUAL TRAINING IN GRAMMAR AND HIGH SCHOOLS—Continued.

hop work om- pul- sory all.	Effect of shop work on the—		Maximum hours which can be devoted to shop work without injury to academic work.	Grade of pupils referred to.	Marginal number.
	Amount and character of academic work in mathematics, science, literature, and in general.	Mind and character different from the effect of academic work.			
Yes..	1. The introduction does not lessen the amount of mathematics; it greatly improves the quality. 2. The same is true of the work in science. The knowledge of tools and principles of construction is invaluable in laboratory work. 3. The amount of language and literature is less than in most schools, but the quality is high. 4. Shop work helps in a high degree to give general intelligence and independent thought and action. In a word, as an education which develops faculty and gives power and a taste for more education, shop work as an element in a curriculum has positive value.	The effect appears to be an unusual clearness in concepts in which definite relations and exact limits are necessary. Sounding phrases are less satisfactory, and the student is not content to stop short of a sound and clear conclusion. In our higher polytechnic work (engineering) the graduates of the manual training school have a high reputation for ability to attack new problems and do independent work. In practical affairs they seem to be able to bear an unusual amount of responsibility in directing work.	10 per week.....	High school.	1
No...	I have observed no appreciable difference. I think all work that tends to develop the manual part of a child's organization should be made compulsory, but should not be so arranged as to break the continuity of regular school work.	Pupils are generally more accurate in their school work.	2 per week.....	Primary, grammar, high school.	2
Yes..	Good.....	Yes. See superintendent's report.	2 per week.....	.....	3
Yes..	Better work done in mathematics and science; no special difference in literature; an excellent effect in general.	Pupils observe more closely and reason from cause to effect. I think the boys are more manly and self-respecting in consequence.	2 per week.....	Highest grammar grades and high school.	4
No...	1. Not marked. 2. Helpful. 3. Not noted. 4. It has drawn attention from this work heretofore, but not much now.	It cultivates the habit of attention and increases carefulness.	1 to 3 per week...	Grammar and high school.	5
Yes..	The manual training pupil does as much work (academic) and does it as well as the one who has academic work only. We are agreed that the influence of manual training in our school is good in every respect, mentally, morally, and physically; and we know that in many instances it has great influence in giving direction to the future life of the pupil.	Our experience is too limited for answer.	Depends on academic course, and many other things.	High school.	6
No...	Generally favorable.....	In some cases the work begets an interest in school which nothing else has secured.	.....	Grammar grades.	7

MANUAL TRAINING IN GRAMMAR AND HIGH SCHOOLS—Continued.

Marginal number.	Name of institution.	Name and official title of person reporting.	Hours per week in—		Character of shop work for—	
			Shop work.	Drawing.	Boys.	Girls.
1	Public schools, Newburgh, New York.	——— ———, superintendent.	2 to 2½	.....	Wood.....	.....
2	Pratt Institute, Brooklyn, New York.	C. R. Richards, director department of science and technology.	8½	3½ to 4½	Wood, foundery, forge, machine shop, tinsmithing.	Sewing, dressmaking, millinery, wood carving, cooking.
3	Technical School, Cincinnati, Ohio.	J. B. Stanwood, director.	10	5	.....	.....

MANUAL TRAINING IN GRAMMAR AND HIGH SCHOOLS—Continued.

Effect of shop work on the—		Maximum hours which can be devoted to shop work without injury to academic work.	Grade of pupils referred to.	Marginal number.
Amount and character of academic work in mathematics, science, literature, and in general.	Mind and character different from the effect of academic work.			
Good. They do as much and as well; from increased interest believe they do better.	Effect is, to a great extent, indirect. We believe it decidedly beneficial.	2 to 2½ per week...	One year grammar, three years high school.	1
We believe that the discipline of concentrated effort obtained through the shop work strengthens the power of application in the academic studies; and that the care and accuracy demanded in these operations reacts most helpfully upon all other school work. We certainly find that the interest of the pupil in his school work, as a whole, is decidedly stimulated by his shop work experience, and that he approaches his other studies with greater zeal than would otherwise be the case. Although we have no means of making a direct comparison between our pupils and those taking academic studies only, we believe emphatically that our pupils would compare favorably with these in intellectual development.	We, however, do not feel that the influence of manual training should be sought in its effect upon the other studies of the school, but rather in the better development of an independent side of the pupil's character, and in the training and discipline of the will. The regular academic studies deal mainly with the processes of the intellect and with the emotions, but the strengthening and development of the executive faculties are peculiarly the province of manual training. In this direction the results are strongly obvious, and the growth of the power of careful, painstaking effort, of persistence, and again, of decision, is most marked. This result of this development means inevitably greater self-reliance, and independence of thought and character.	½ of school day....	High school	2
As our school is operated upon the plan that shop work is a benefit to academic work, our existence is an answer in the affirmative. The exceptional cases (in which pupils do not take shop work) all indicate that the pupils taking shop and academic work accomplish the most. The field of observation, however, is rather small, too small, in fact, to base a positive statement upon.	Our shop work appears to give greater self-reliance and steadiness to pupil's character. Perhaps steadiness represents the trait that seems to be most dominant. This steadiness represents, to our minds, the formation of the habit of industry; this industry, too, is apparent in the academic as in the shop work.	3 per day.....	High school.	3

MANUAL TRAINING IN GRAMMAR AND HIGH SCHOOLS—Continued.

Marginal number.	Name of institution.	Name and official title of person reporting.	Hours per week in—		Character of shop work for—	
			Shop work.	Drawing.	Boys.	Girls.
1	High School, Toledo, Ohio..	H. W. Compton, superintendent.	3 to 7½	3 to 3½	Wood, foundery, forge, machine shop.	Wood carving, sewing, cooking, dressmaking.
2	Girard College, Philadelphia, Pennsylvania.	A. H. Fetterolf, president.	a 5	b 1 to 5	Wood, metal, foundery, electrical mechanics.	.....
3	Manual Training School, Philadelphia, Pennsylvania.	Edward Brooks, superintendent.	10	5	Wood, foundery, forge, machine shop, tin.	.....
4	Public schools, Tidioute, Pennsylvania.	R. D. Crawford, superintendent.	3	2	Wood.....	Wood.....
5	Public schools, West Chester, Pennsylvania.	Addison Jones, superintendent.	2	2½	Wood.....	.....

a Including mechanical drawing.

MANUAL TRAINING IN GRAMMAR AND HIGH SCHOOLS—Continued.

hop ork om- ul- ory ali.	Effect of shop work on the—		Maximum hours which can be devoted to shop work without injury to academic work.	Grade of pupils referred to.	Marginal number.
	Amount and character of academic work in mathematics, science, literature, and in general.	Mind and character different from the effect of academic work.			
No...	Our pupils go right along with the manual training work and the text book work; those in manual doing just the same amount of work in text books as those who take no manual work. So far as I can judge from general observation of the characters and the mental work of the pupils, I see but little difference in the two classes of pupils. Some pupils do both kinds of work easily; some, less fortunate in mental organization, will fail to do either line well.	I think the effect of manual training on the minds and characters of pupils is healthful and wholesome. So much depends on the mental constitution of individual pupils that it seems to me it will always be a difficult matter to answer satisfactorily such questions as the above.	.....	Highest grammar grade and high school.	1
Yes..	Our experience is that boys do better in academic work with practice in manual training. In mathematics they have better ideas of the form, size, and dimensions of objects. In natural science they are benefited by the knowledge they acquire of the facts and forces of matter. Our school week consists of thirty-two hours, and we are convinced that we accomplish more in twenty-seven hours with manual training than we would in thirty-two hours without manual training.	We find that since the introduction of manual training our discipline is made easier, and that boys show more intelligence in comprehending whatever is brought to their notice, while, in general, they have a wider range of thought.	2 per day.....	Grammar and high school.	2
Yes..	We believe that the pupils in our manual training school do quite as much work in a given time as those in any city high school, and that the character of the work they do is quite as good as the work in the average high school.	Manual training strengthens the power of the will, develops the faculties of observation and judgment, and gives a keen intellectual grasp generally of the principles of mathematics and science, and as a consequence it has a beneficial influence morally.	The same time as is given to academic work.	High school.	3
No...	They do as much work and fully as well. I think the proper place for manual training is in the grammar schools. Have tried it in both grammar and high school for six years.	More practical....	1 per day	Grammar ...	4
No...	The boys do as much work, and, I believe, do it better than the girls who do not go to the shop.	The work in the shop inculcates the habit of seeing things when they are looked at by the pupils. The shop makes the boys more accurate in their thinking. More boys desire to learn trades, and, especially, more of them go to the engineering courses at college.	2 per week.....	High school.	5

b Free-hand.

MANUAL TRAINING IN GRAMMAR AND HIGH SCHOOLS—Concluded.

Marginal number.	Name of institution.	Name and official title of person reporting.	Hours per week in—		Character of shop work for—	
			Shop work.	Drawing.	Boys.	Girls.
1	Le Moyne Normal Institute, Memphis, Tennessee.	A. J. Steele, principal.	5	2½	Wood, printing.	Sewing, cooking, printing.
2	Public schools, Appleton, Wisconsin.	O. H. Ecke, principal Ryan high school.	5	5	.....	.....
3	Public schools, Menomonie, Wisconsin.	R. B. Dudgeon, superintendent.	5	3½	Wood.....	Cooking, sewing.

MANUAL TRAINING IN GRAMMAR AND HIGH SCHOOLS—Concluded.

Shop work compulsory to all.	Effect of shop work on the—		Maximum hours which can be devoted to shop work without injury to academic work.	Grade of pupils referred to.	Marginal number.
	Amount and character of academic work in mathematics, science, literature, and in general.	Mind and character different from the effect of academic work.			
'es..	In mathematics and science, direct and undoubted help. In literature and generally, can see no injury. We prize most highly the educational side or value of manual training.	The tendency is to train or lead to natural methods of study; cramming or mere memorizing is dropped for real study.	¼ of school time ..	Grammar and high school.	1
o...	It does not interfere with academic work in any of these subjects, and rather helps out observation in science.	It makes them more practical in their thought, and produces better and more interested workers.	5 per week.....	Upper grammar and high school.	2
o...	After the novelty of the work wore off the academic work did not suffer in the least. In many cases, especially among the slower pupils, the academic work seemed to improve.	I did notice that the pupils who were noticeably careless and untidy in their work in academic lines became ambitious to do work which compared favorably with that of other pupils, and it seemed to me that these pupils were somewhat inspired by a self-respect and pride which reached beyond the school work.	2 per day	High school.	3

MANUAL TRAINING IN UNIVERSITIES AND TECHNOLOGICAL SCHOOLS.

Marginal number.	Name of institution.	Name and official title of person reporting.	Hours per week in—		Character of shop work for—	
			Shop work.	Drawing.	Boys.	Girls.
1	University of Illinois, Champaign, Illinois.	Thomas J. Burrill, acting regent.	10	.....	Wood, iron	.....
2	Rose Polytechnic Institute, Terre Haute, Indiana.	H. T. Eddy, president.	10 to 15	6	Wood, metal.	.....
3	Iowa Agricultural College, Ames, Iowa.	G. W. Bissell, professor of mechanical engineering.	8	6	.....	.....
4	Massachusetts Institute of Technology, Boston, Massachusetts.	H. W. Tyler, secretary.	.....	.....	Wood, metal.	.....
5	Polytechnic Institute, Worcester, Massachusetts.	H. T. Fuller, president.	15	6	Pattern-making.	.....
6	University of Michigan, Ann Arbor, Michigan.	C. G. Taylor, superintendent of shops.	9	4	Machine-shop, patternmaking, foundery, forge.	.....
7	Cornell University (Sibley College), Ithaca, New York.	R. H. Thurston, director Sibley College.	9	9	The four principal shops.	.....
8	Texas Agricultural and Mechanical College, College Station, Texas.	——, president	4	2 to 5	Wood, forge, machine shop.	.....

a In English courses.

MANUAL TRAINING IN UNIVERSITIES AND TECHNOLOGICAL SCHOOLS.

hop ork em- ul- ary all.	Effect of shop work on the—		Maximum hours which can be devoted to shop work without injury to academic work.	Grade of pupils referred to.	Marginal number.
	Amount and character of academic work in mathematics, science, literature, and in general.	Mind and character different from the effect of academic work.			
es(a)	The men do same class work as others not taking shop work, and are certainly not behind.	Nothing definite noticed.	2 per day	Freshman class, college.	1
Yes	We have no academic pupils	It increases alertness and powers of observation, besides the training it gives in practical professional affairs.	Varies according to circumstances.	College grade.	2
.....	The above can hardly be filled out as you desire, because the department of mechanical engineering offers a special course of study calculated to develop the student into a mechanical engineer and does not give much general training, the supposition being that he has had it or will obtain it later.			College grade.	3
No	No effect noticed. Shop work and drawing play so secondary a role that not much can be added to what I have said.	No effect noticed		College	4
es(b)	Favorable in all cases	Precision and thoughtfulness increased.	15 per week	College grade.	5
es(a)	1. Good; 2. good; 3. medium; 4. good.	The mind and body are stronger.	2 to 2½ per day	College	6
Yes	Good in all respects. I think better.	Keeps them alert, ready, and efficient.	3 per day	College	7
es(b)	As good or better			College	8

b In mechanical department.

Independent inquiries which have been made all seem to indicate the truthfulness of the conclusion reached by Dr. Belfield, as stated in his report of May 1892, given above, relative to his study of the question in Europe, that the combination of mental and manual work does not diminish the amount of purely academic work done, provided the manual work is held properly in abeyance; and as to specific time, the facts justified him in stating that from one to two hours per day, according to the age of the pupils and the character of the work, can be profitably applied to the manual side of education. The evidence brought out in the foregoing tabulated statement relative to American institutions clearly justifies this conclusion, and, as stated, independent inquiries by officers of the Department of men who have had long experience, both in carrying on the work of manual training schools and in manual training as applied in reformatories, result in the positive corroboration of such conclusion.

CHAPTER XIII.

NUAL TRAINING AND TRADE INSTRUCTION IN REFORMATORIES.

CHAPTER XIII.

MANUAL TRAINING AND TRADE INSTRUCTION IN REFORMATORIES.

As progress is made in the study of criminology the causes of criminal action become more clearly understood and the criminal appears more and more in the light of an undeveloped being; and he is undeveloped in all his faculties, whether he is considered as a worker or as a moral and intellectual being. Not only are those faculties which enable a man to labor honestly and faithfully for the care and support of himself and family undeveloped, but all the others. If this position be the correct one penology should find ways and means of developing the criminal in all his faculties. The corrigible criminals, or those amenable to reformatory efforts, represent probably from one-eighth to one-sixth of all long term convicts. Under modern penological views there is a revolt from the old, cruel, and barbarous system of setting prisoners at work at what is known as purely penal labor, that is, running a tread-mill or turning a crank; and the assumption now is that men in prison should be set at work in the same industries and in the same way and under the same methods which exist outside of prisons. This plausible position is taken by most penologists; but when the matter of reformation is considered, then the question of development along those lines on which a boy can best be developed becomes important. The criminal must be kept in honorable and skilful employment; his intellectual and moral powers, if susceptible of development, must be trained in various directions. The treatment of this subject, appealing broadly to philanthropic interests, as well as to all who desire to secure the safety of society, must be illustrated by one grand example only, that drawn from the experience of the New York State Reformatory at Elmira; for the experience of this institution can be the experience of all institutions wherever conditions are similar. The information relating to this celebrated reformatory is taken from the writings of the editor of The Summary, a periodical published at the Elmira reformatory, the editor always being an inmate of the institution, and the Sixteenth Year Book of the institution; and many of the statements herein made are in the actual language taken from these works and adapted to the methods of an official report.

The Elmira reformatory of today is to the reformatory of 1876, to put the proposition mathematically, as sixteen is to one. From a mere modernized penitentiary, as it was essential it should be in the first

few months of its existence, when its population was recruited with more or less discrimination from the state prisons at Auburn and Sing Sing, and with accommodations for less than 500, the institution has been developed into a great compulsory educational establishment for improvable felons and corrigibles; and there were, at the close of 1891, about 1,300 men undergoing a systematic process of reintegration and preparation for again commingling with society. Moral, mental, and manual training have been systematically coördinated, with the end in view of turning out practical, self-helping, self-controlling citizens. As is well known the system in practice at Elmira is that of indeterminate sentence, the reformable convict being sent there by the courts under a sentence to last until the proper authorities consider the inmate competent to mingle again with his fellows outside the institution, and even then the institution has its hold upon the discharged or partially discharged convict. In the treatment of the inmates convalescence was construed to be moral, intellectual, and physical capability to earn a livelihood, and a disposition to live in consonance with the self-protective requirements of society. Under this consideration of what criminal convalescence is it is obvious that the course of treatment essential to secure it would be cultivation of mind and body to a point that would render the subject fit to take an honorable stand in the honest vocation which seemed best adapted to his conditions. The reformatory prescription, then, as stated by the editor referred to, consists of a trinity of m's—mental, moral, and manual training—and these ingredients have been used in varying proportions during the past sixteen or seventeen years, their relations in the remedy being invariably controlled by the needs of the patient as developed in diagnosis, and oftentimes by the invention of better methods and the intervention of new laws. The success of the application of this prescription has been such that at the end of a decade the reformatory had firmly established itself as something more than an experiment, although it has continued to rank as an experimental station, inasmuch as opportunity is constantly afforded for the test of plans that offer promise of aid in accomplishing the ends aimed at. While the cardinal features of the reformatory plan have remained unaltered, from the first there have been numerous changes in the details of the curriculum, and during the past few years there have been many innovations resulting from the variable statutes, the immense increase in intermural population, and a more widespread understanding of the reformatory's system and its object by the general public. Both design and chance have conspired to give prominence to the educational factor, until now the term "technological university" is often applied to the institution; and the term can hardly be regarded as a misnomer. The apparent chief pursuit at present of a large majority of the inmates is education, and from sunrise until considerably after sunset their minds, their wills, and their muscles are exercised, now in acquiring a service-

able trade and learning to apply it, now in bridging the chasm between illiteracy and a comprehension of language, mathematics, and the sciences, and again in debating and deciding theoretical and practical moral points which had been entirely unconsidered by the inmates, and always in practising self-control and subordination to constituted authority, which is the concomitant of a strict disciplinary régime.

Systematic trades instruction was first undertaken in 1886, and then only in a small way, owing to lack of space and absence of suitable appliances. In that year three connected one story pavilions, Greek cross shaped and affording 27,000 square feet floor room, were constructed and fitted with paraphernalia for teaching the rudiments of half a dozen trades, including plastering, bricklaying, stone cutting, blacksmithing, carpentry, and frescoing, to about 150 men. Only an hour and a half of two evenings each week were set apart for instruction and practice, and yet most gratifying results were noted. It was just about this time that the labor system was being changed from the contract to the state account, in conformity with the will of the people expressed by their ballots, and it was planned to take advantage of the opportunity thus provided to reinforce the trades instruction by the establishment of diversified industries in which a fair amount of skill would be required, whereby inmates could in their daily labor prepare themselves to earn sufficiently when relieved of restraint. Much progress had been made in this direction, and the scope of the evening trades school had been greatly widened when the legislature, in the summer of 1888, passed a bill which substantially prohibited all convict labor, except for the making of articles to be used by the state in its various institutions. This measure, in its application to the reformatory, seemed to demand the substitution of the trades school for productive labor, and it was not many weeks before all the inmates of the institution, excepting those required for the conduct of its clerical and domestic affairs, had been organized in trades classes and were devoting half of every day in fitting themselves for engaging as journeymen or advanced apprentices in some one of twenty-five trades taught. Disciplinary officers were engaged with special reference to their competence to impart technological instruction, and courses were prepared with the utmost care. For those whom it would benefit classes in mechanical drawing were formed under expert draughtsmen. Capacity to earn a living at some recognized trade became, under the rules, indispensable to conditional release.

The effects upon the men were most salutary. In this method of reformation, at least, there was nothing too occult for them to understand. Many of them who had hitherto had very meagre conceptions of the value of industry were promptly brought to a realization of the fact that their criminality and its consequences were largely due to

lack of ability, and sometimes, even, of the disposition to maintain themselves, as did their honest and plodding fellow beings. Hands, as well as minds, were without culture.

"If I had been taught a trade at either my first or my second imprisonment I should never have known a third conviction for crime," earnestly declared one youth of 19 years upon tearfully confessing to the superintendent that he had already been a prisoner in a reform school and a state prison. Upon appearing before the parole court the almost invariable answer of the applicants for a term of "enlarged liberty without the inclosure" to the query, "What will you do for a living when released?" has been, "Why, work at my trade—the trade I have learned here."

The prison law of 1889 was so thoroughly in harmony with the arrangements in vogue at the reformatory at the time of its passage that its only immediate effect was to encourage an extension of the trades school system and to warrant projects for its permanency. At that period the inmates of the reformatory were, as, indeed, they are now, divided into three grades, described as the first, second, and third. The intermediate (second) was that into which all prisoners were initiated upon their arrival. From it, by six months of perfect record in the schools of trades and of letters and in general conduct, they could be advanced to the first grade, from which in another six months their conditional liberation might be authorized, or, through a serious infraction of the rules or a sequence of imperfect monthly records, they could be reduced to the third, or convict grade, out of which they could only extricate themselves and begin to make headway toward release after from three to twelve months, according to the frequency with which they had displayed tendencies to rank with the incorrigibles. The new law adopted the same nomenclature in designating the three classes of prisoners in the state penitentiaries. In the third grade it placed all those convicts regarded as wholly incorrigible and whose labor was to be neither instructive nor productive. Of this class there were scarcely any in the reformatory, and to avoid confusion, since the section of the statute was adjudged to apply to this institution, there was a rechristening of the grades without alterations of the regulations applying to them. The first grade became known as the upper first, the second as the lower first, and the third as the second.

With this understanding of the classification it will be readily appreciated how favorable was the new law to the furtherance of the trades school scheme when it is remembered that the legislative act commanded that all prisoners of the first and second grades shall be employed "with reference to fitting the prisoner to maintain himself by honest industry after his discharge from imprisonment, and it is the primary or sole object of such labor." It was furthermore decreed in the law that "such prisoners of the first grade may be so employed at

hard labor for industrial training and instruction solely, even though no useful and salable products result from their labor," and that "the labor of the second grade shall be directed primarily to the production of useful and salable products, but secondarily to fitting such prisoners to maintain themselves by honest industry after their discharge from prison, even though their labor be rendered thereby less productive."

Under these circumstances there has been no haste in resurrecting the strictly industrial feature of the reformatory, since it was apparent that the main object could be more surely brought about through the building up of the technological department until it had attained its highest plane of usefulness. It is now furnishing instruction to men in no less than 32 distinct trades, for periods of from two to eight hours a day, and some of the classes are so organized and equipped as to be able to manufacture for revenue. The trades taught and the distribution of the pupils among the various classes on October 1, 1891, were as follows:

Iron moulding	88	Wood working (machinery)	4
Iron forging	16	Cabinetmaking (bench work)	25
Machinists	56	Hard wood finishing	22
Horseshoeing	16	Wood turning	14
Patternmaking	7	Upholstery	32
Brass moulding	5	Wood carving	26
Brass finishing	28	Bookbinding	27
Plumbing	30	Cooking	16
Steam fitting	4	Baking	5
Tinsmithing	20	Shoemaking	24
Stone cutting	41	Stenography	19
Bricklaying	131	Music (band)	32
Plastering	23	Barbering	21
Frescoing	32	Electricians	3
Carpentry	72	Printing	27
Boat building	43	Tailoring	42

Of inmates not receiving trades instruction on that date 87 had graduated from the technological department, 58 were equipped with a trade on admission and required no instruction, 120 were in the second grade and had been transferred on that account to a productive industry, and the remainder of the population included those physically incapacitated, awaiting parole, or awaiting assignment.

In imparting trades instruction the efforts of the tutors is not bent, merely, toward giving a theoretical knowledge, but they endeavor to graduate practised, practical workmen. Abundance of opportunity for putting to a test the efficiency of the pupils is found in the requirements of the establishment. A new guard wall, 850 feet long and 21 feet high, and an additional building, 450 feet long, containing 504 cells, class rooms, and officers' quarters, with all appurtenances, are, with the exception of the masonry of the walls and a portion of the stone foundations of the extension, the work of trades school classmen. The

enlargement, refurnishing, and redecorating of an assembly hall, to seat 1,500, are likewise chiefly the work of pupils of the trades school divisions, and all the wearing apparel of the inmates is made in the tailoring and shoemaking classes.

In so far, at least, does the reformatory reform that none of its charges is permitted to pass to liberty until he can read and write with facility, and has mastered the four rudimentary principles of arithmetic. This is the minimum requirement. A majority of those who are deemed suitable subjects for the parole privilege have reached an educational standard on a par with that of graduating classes in public grammar schools, and many finish a course similar to that prescribed for high schools.

The school system had its inception in the second year of the institution's active existence—1877. The attendance then, as ever, was compulsory. One hundred and seventy men, most of whom were transferred from state prisons, and two-thirds of whom had no knowledge of simple arithmetic, were divided among twenty small classes and instructed in the elementary principles of language and mathematics by inmate teachers. In 1879 a systematic and more advanced school course was devised and inaugurated by an Elmira college professor, to whose aid were summoned several experienced pedagogues. This course has increased yearly in efficiency and grown wider in range until now it is bounded by a kindergarten on the one hand and a geometry class on the other, and embraces, besides its eight language and nine arithmetic classes, divisions studying English literature, American and ancient history, political economy, civil government, physical geography, algebra, electricity, ethics, and moral philosophy.

The school is divided into three major divisions—the primary, the intermediate, and the academic. These are again divided into classes, the primary department having six subdivisions and the intermediate and academic two each. There are, in addition, special classes for the teaching of English to German, French, and Italian speaking inmates. The classes assemble on Monday, Tuesday, Wednesday, Thursday, Friday, and Saturday evenings at 6.30 o'clock, and continue in session until 8. There are also Sunday sessions for instruction in practical ethics and moral philosophy. The school exercises continue from one year's end to the other, with only sufficient intermission between the terms to give time to reorganize the classes.

It will be seen that the design is that every corrigible prisoner shall, prior to his release, take a course of instruction in the trade which seems to the management best adapted to the requirements of his future life; for to make and hold a place as a respected, law abiding citizen it is of paramount importance that he be equipped with a practical knowledge of some handicraft through which he may earn sufficient to satisfy his reasonable wants. The assignment to a mechanic arts class is made by the general superintendent immediately on the

inmate's arrival. The organization of all training, both manual and trade, is quite complete, so much so that during a greater portion of the working time of the week the institution is, as has been intimated, a vast technological training school, in which upward of thirty recognized trades are being taught to over a thousand youths and men.

In its general organization the trades school has two divisions. In one of these are included all classes in which the end is exclusively instruction and in the other are the classes in which production is an object, though secondary to instruction. In both divisions the pupils are given ample opportunity for practical work, and to test their earning capacity. The least amount of benefit is derived by those who are engaged in the productive branches, in finishing hardware, making umbrellas, pipes, and packing boxes, and to these occupations are chiefly assigned second grade men, who by their loss of standing have forfeited for the time the privilege of learning a more useful trade.

In many of the classes the instruction afforded is sufficient to prepare a pupil of average ability to take and hold a place as a journeyman, while in others the time allotted is so brief and the opportunities for practice are so limited that a certificate of graduation simply predicates that the holder is fitted to rank as an advanced apprentice. He has, however, in a few months acquired a technical and scientific knowledge of his work that would have taken him as many years to pick up in a shop, and has reached a stage at which he may quickly attain a value as a mechanic. The courses for the various classes are carefully planned, and each instructor, who is an expert in his line, is provided with a printed outline describing in detail the order in which lessons are to be imparted and the number of hours' exercise for each part. When a pupil has spent a specified time on any one part of an outline he is examined, and, if proficient, takes up the next succeeding part. Failing to come up to the standard he is marked accordingly and continues practice on the same part. The basis of marking is similar to that in the school of letters, the inmate losing from one to three labor credits according to the judgment of his relative efficiency as represented in the percentage credit allowed to him between zero and seventy-five.

Bricklaying.—Members of this class have been particularly fortunate during the past year in having an unlimited amount of practical work upon which to test their capabilities and gain the experience which gives them confidence. Under the direction of citizen foremen the class and its graduates have raised the walls of the new north wing extension, 450 feet long, with the massive cell-house blocks within; built the greater part of the new north guard wall, 850 feet long and 21 feet high; reared a chimney for the main steam making plant, 140 feet high; and are at this writing putting up the walls of the new three story industrial building adjoining the new extension. The course of instruction and practice for the bricklaying class is as follows:

COURSE IN BRICKLAYING.

	Hours.
Spreading mortar on board and on wall	30
Laying out wall; first dry, then with mortar	30
Eight-inch wall without plumb or line; spread mortar for three bricks, striking joints	30
Twelve-inch square piers, and chimneys, striking joints	30
Eight-inch wall with plumb and line, with chimney, fire-place; turn corners, build pilasters	60
Twelve-inch wall with plumb and line, with fire-place, flues; turn corners, build pilasters	60
Eight-inch plain wall; turn corners, spread mortar for three bricks, build pilasters, run projections between pilasters to face of same	60
Ditto for twelve-inch wall	60
Sixteen-inch wall; turn corners, attend to headers outside and inside, run wall high without scaffold	30
Sixteen-inch wall; bats for backing and filling, putting flues in wall without projecting	30
Semicircular arches, 4 inches by 8 inches and 12 inches by 16 inches	60
Segmental arches, 4 inches by 8 inches and 12 inches by 16 inches	60
Gothic arches, 4 inches by 8 inches and 12 inches by 16 inches	60
Dovetail arches, 8 inches by 12 inches	30
Eight-inch wall; turn corners, set door, window sills, and frames; semicircular arch over all	30
Twelve-inch wall; corners, pilasters, windows, doors, semicircular arches; bracket cornice between; pilasters connected by semicircular arch	30
Sixteen-inch wall; corners, windows, doors, semicircular arch outside, segmental arch inside over windows, dovetail over doors	30
Gables, plain and with windows	30
Arches, gables, octagons, and half octagons	30
Change square to octagon	30
Battering brick work plumb	30
Long plain twelve-inch wall; pilasters, windows, doors; work fast	60
Mixing mortar; two lessons a month for 1 year.	

Before graduation each man must be able to lay bricks plumb, neatly, and at the rate of 600 bricks in eight hours. There are no limitations upon the size of this class during the building season, and as many as 150 pupils have been carried on its roll.

Plastering.—As this trade is so closely allied to that of bricklaying it is taught chiefly to the same men, sometimes before and sometimes after they have completed their course with the plumb and trowel. The instruction is given in booths formed of stud partitions, lathed in the usual manner, and arranged to present the conditions ordinarily to be found in rooms of various shapes. These furnish accommodations for 18 men at a time. Advanced members of the class have found practice during the year in plastering the walls of the new auditorium and of the 504 cells in the new extension, and they are called upon frequently to re-plaster rooms in many parts of the institution. The course of instruction and practice is as follows:

COURSE IN PLASTERING.

	Hours.
Lathing	40
Making mortar, when and how to begin plastering, thickness of coat	40
Names of tools, scratch coat, how put on, and what for	72
Brown coat, how put on, when and what for; screeds and spots and their object.	72
Putting brown coat on lath	40
Putting brown coat on brick or stone work	40
Finishing brown coat for paint or fresco	40
White coat, clear lime skin, lime and sand skin	40
White coat, sand finish, trowel work	40
White coat, sand finish, float work	40
White coat, hard finish, preparing, applying to wall, using trowel and brush, finishing angles and corners	144
Applying scratch coat to arches and different angles	40
Applying brown coat to arches and different angles	40
Cornice, centre pieces and circles, preparing material, etc	72
Making centre pieces and putting on wall	40
Turning circles on wall and white coat around them	40
Preparing mortar for different kinds of work; preparing lime for white coat	40

Fresco painting.—The equipments of the class room in which this trade is taught are sufficient to accommodate 30 persons. There are wooden screens for beginners, supplemented by hanging ceilings. When the pupil has developed sufficient facility he is given work on walls and ceilings wherever decoration is required. During the past summer the plaster of the new auditorium has been very artistically treated by members of this class, many of whom exhibit exceptional merit. The course of instruction and practice is as follows:

COURSE IN FRESCO PAINTING.

	Hours.
Preparation of walls	24
Drawing one-inch lines	24
Drawing fine lines	24
Drawing lines to represent woven work	24
Drawing beveled squares, quadrilaterals, and hexagons with fine lines	72
Stencilling, joining where ties occur, edging with fine lines	72
Making appropriate top and bottom borders for stencil	60
Free-hand practice on simple geometric designs, laying out and edging with fine lines, high light, and shade	120
Laying out and finishing ceilings, including free-hand work	120
Imitation of moulding, light and shade	60
Free-hand borders and scroll work	100
Finishing ceilings overhead, all free-hand work	120
Final examination, test piece	120

Stone cutting.—The contributions of the advanced pupils of this class to the building erected during the past year are scarcely less noteworthy than those of the bricklayers. They have furnished all the cut stone for the foundations, copings, and general trimmings of the north wing extension. This has given them sufficient practice to qualify them to hold places with journeymen of considerable experience.

The planned course covers all kinds of work in common use. The class room has a floor space of over 10,000 square feet and no limit is placed on the size of the class. The course of instruction and practice is as follows:

COURSE IN STONE CUTTING.

	Hours.
Roughing out stone	60
Making smooth surface on stone	60
Droving and smoothing stone	75
Tooling	60
Square jointing	40
Chamfering and droving water table, and jointing same	50
Cutting window sills with bevels	20
Cutting round arches	20
Cutting Gothic arches	20
Straight mouldings	60
Mouldings with returns	60
Gothic and round arches, combined with mouldings	80
Round arches and mouldings for belting course	60
Spur stone for gable roof	100
Making a complete window	100
Making jambs for mantel	30
Making shelves for mantel	30
Making lintel for mantel	30

Carpentry.—With men who have a choice of trades this class appears to be the most popular. The number of requests to join it are always considerably in excess of the accommodations, although plenty of room is found for those whose predilection is natural, or is based on something more substantial than mere fancy. The course comprehends a wide range, and it is expected of graduates that they shall be capable of erecting a wooden tenement from cellar to ridge pole. In fact, one of the tests of efficiency has been the building of miniature frame houses. First the sills are laid and the studding begun, then the ribbons are placed in position and the joists are laid across. Each joint is made with due attention to the advantageous cutting of the lumber. After the rafters are in place the plancher and frieze are put on, the roof boards are fastened, and the eaves finished off. The outside doorways and all the windows are also inserted, each form being complete in every particular. In the building operations of the institution no class has been more useful; abundant meritorious evidences of the thoroughness of its instruction being found in the structures put up during the year. The course of instruction and practice is as follows:

COURSE IN CARPENTRY.

	Hours.
Use of rip-saw, coarse and fine cross-cut saws	25
Planing a 2 by 4, out of wind, to gauge and square	50
The carpenter's square	8
Chamfering, using chisel	38
Mortises	38

	Hours.
Tenons	38
Making a frame of a given size, with mortises and tenon joints	50
Halving together	25
Making a frame of a given size, halving together the joints	38
Mitre joints	25
Making a box or frame of a given size, using mitre joints	38
Making timber splices, draw bore and pin together	63
Dovetail	38
Making a box of a given size, dovetailing it together	50
Blind dovetail	38
Making a box of a given size, blind dovetailing it together	50
Lock and key	25
Hinges	38
Window-frames	50
Door-frames	38
Skirting	25
Stud partition and bridging	38
Coping, round casing, and moulding	38
Filing both rip and cross-cut saws	75
Final examinations	125

Connected with the carpentry class is a small group of men engaged in making packing cases. This ranks as a productive, as well as instructive, industry, the products being taken up by the hardware and cabinet departments for shipping stock.

Wood turning.—This course is brief, requiring only from three to four months to complete for those who are assigned to the class half of each working day, and it usually follows or precedes a training in some other wood working branch. It is as follows:

COURSE IN WOOD TURNING.

	Hours.
Using of gouge in turning parallel rods	7
Using of flat chisel in turning parallel rods	7
Using of flat chisel in cutting beads	15
Using of small gouge in cutting grooves	15
Turning spindles	60
Turning chair and table legs, etc., from patterns	60
Turning rosettes, plinth blocks, core pulleys, etc	60
Turning hollow work	30
Turning spheres and ovoids	15

Wood carving.—This is one of the five trades taught in the two story shop building known as the cabinet works at the west end of the enclosure. The advanced pupils and graduates of this and the four classes mentioned in the next paragraphs contribute toward the manufacture of sideboards, lounges, piano stools, etc., of cheap and fine grade, which are put upon the market. The men detailed to the wood carving class are selected from among those who evince artistic tastes and exceptional appreciation of form. The class room is designed to accommodate 18 men at the benches at one time. The course of instruction and practice is as follows:

COURSE IN WOOD CARVING.

	Hours.
Incised or intaglio work, involving straight and curved lines	25
Simple checked panels, using not more than three tools	40
Intaglio designs in lines of varied widths and depths, combined with incised leaves	100
Conventional leaf carving with broad bold sweeps and plowing curves	50
Conventional designs of greater freedom from the Gothic	100
Panels of cabinets	60
Carving of a leaf in the solid	60
Carving of an animal's head	100
Carving of an ivy vine in the solid	60
Different kinds of fruit	100
Different kinds of fish	100
A vase and flowers	100
Final examination, test piece	100

Wood finishing.—The staining, finishing, shellacking, varnishing, and rubbing of the surface wood work of all furniture made in the cabinet works devolves upon members of this division as rapidly as they become proficient. In each part of the course there is much practical work, and it is done with great care, since it is subject to the most searching and critical scrutiny before it is permitted to pass to the upholstery or cabinet classes, as the case may be. The course of instruction and practice is as follows:

COURSE IN WOOD FINISHING.

	Hours.
Sandpapering soft wood, walnut, and ash	60
Sandpapering oak and cherry	40
Staining cherry and walnut	40
Staining ebony and mahogany	40
Filling ash, oak, and walnut	60
Puttying	20
Shellacking soft wood	60
Shellacking walnut	60
Shellacking ash	60
Shellacking oak	60
Sandpapering the shellac, soft and hard wood	40
Varnishing soft wood	60
Varnishing hard wood	60
Rubbing	120
Polishing	80
Refinishing furniture	150

Cabinetmaking.—Preliminary to engaging upon the active work set apart for this class, the members receive lessons in the care and use of the great variety of tools required by cabinetmakers. They are then given considerable practice on "dummy" work, and finally are engaged upon sideboards, joining the parts as they come from the machine room and fitting the locks, trimmings, plate glass, etc. The sideboards are of various shapes and in many designs, and are finished in the natural woods, or in antique, sixteenth century, and old English styles.

Upholstering.—Practice in upholstering all grades of sofas, lounges, ottomans, chairs, and piano stools is obtained by this class without

stint, the labor of the members, after they have advanced sufficiently in their outlined course, being directed toward preparing goods for sale. The cushioned furniture is made in a great variety of shapes and is covered with all materials ordinarily used, from Brussels carpet to Turkish rugs and the finest silk plush. The course of instruction and practice is as follows:

COURSE IN UPHOLSTERING.

	Hours.
Springing up lounges	24
Upholstering base and arm	48
Upholstering back	12
Finishing complete lounge	84
Forming rolls	8
Stitching rolls	8
Putting on covers	32
Constructing upholstery for whole sofa	84
Spring edges	18
Double stuffing	18
Covering	36
Putting on fringe	1
Upholstering complete sofa	84
Small chairs	15-20
Arm chairs	10
Rockers	16
Sofas	20
Student chairs	30

Wood working machinery.—Under this class head come a considerable number of men who are taught how to care for and manipulate the great variety of wood work machines used in turning out the product of the cabinet works. It is sought to make them thoroughly familiar with a full line of power machinery, and they have opportunities for treating elm, walnut, cherry, oak, chestnut, basswood, whitewood, cucumber, beech, maple, hickory, and ash, learning the peculiarities of the grain, and the effect of the various woods on knives and saws. Among the machines used are band-saws, buzz-saws, surface planers, shapers, turning lathes, tenon-saws, dovetailers, horizontal and vertical borers, swing-saws, buzz planers, sanders, and carvers.

Boat building.—A year's conscientious labor at the various tasks in this department is generally sufficient to qualify men to select lumber for and to build small boats. The production of the shop includes Saint Lawrence river skiffs and Adirondack boats from 10 to 24 feet long, smooth seam and canvas canoes, open and decked sail boats, sailing canoes, steam launches, spoon oars, paddles, and sails, all of which are made for the trade. The boats are chiefly of the better grades, smooth and lapstreaked, and most frequently finished in the natural wood colors, highly polished, with plain and inlaid decks, and brass and silver plated trimmings. The pupils are taught, in this order, planing and sawing stock, keel laying, planking, ribbing, decking and seating, sandpapering, oiling, shellacking, varnishing, trimming, and crating, and they are also instructed in the methods of fashioning oars and paddles and of cutting and stitching sails.

Type setting and printing.—Those assigned to this class are first given a full course in composition, and are not considered fully competent for graduation until they can set fair copy, correct proofs, and distribute at the rate of 1,000 ems per hour. Thereafter, if they display an aptitude for the printing business, they are advanced to stone work and to the press and job rooms. Then they receive instruction in making up forms, methods of measuring margin, arranging the furniture, and locking up forms; arrangement of title pages and other displayed matter; sizes, quality of paper and cardboard; in the handling of hand presses and power platen and single cylinder presses; regulation of impression, making register; rollers, their composition and mode of manufacture; making wood and metal cuts ready; use of paper cutters, etc. Below is the course pursued in the composing room and showing the rate at which the type setter is expected to develop speed:

COURSE IN TYPE SETTING AND PRINTING.

	Hours.
Names and uses of articles in printing office plant	24
Learning case and distributing	32
Use of composing stick and rule	32
Sizes and designation of type	24
Copy marks	8
Straight composition, reprint and manuscript copy; nonpareil, brevier, and long primer. Task 250 ems per hour	60
Task 280 ems per hour	60
Task 310 ems per hour	60
Task 350 ems per hour	60
Task 380 ems per hour	60
Task 410 ems per hour	60
Task 450 ems per hour	60
Task 480 ems per hour	60
Task 510 ems per hour	60
Task 550 ems per hour	60
Task 580 ems per hour	60
Task 610 ems per hour	60
Task 650 ems per hour	60
Task 680 ems per hour	60
Task 710 ems per hour	60
Task 750 ems per hour	60
Task 760 ems per hour	60
Task 780 ems per hour	60
Task 800 ems per hour	60
Task 810 ems per hour	60
Task 830 ems per hour	60
Task 850 ems per hour	60
Task 860 ems per hour	60
Task 880 ems per hour	60
Task 900 ems per hour	60
Task 910 ems per hour	60
Task 930 ems per hour	60
Task 950 ems per hour	60
Task 975 ems per hour	60
Task 1,000 ems per hour	60

In the plant of the printing office is included a Columbian hand press, a universal jobber, and a single cylinder newspaper press, all of which are in constant use every secular day in turning out the thousands of lesson leaflets for the schools, the great mass of printed stationery and books required by a busy, compact community of nearly 1,500 persons, and in taking impressions of The Summary, the periodical published in the institution. The stock of display type contains over a hundred fonts of modern casting.

Bookbinding.—The bookbindery, as is fitting, is a close neighbor of the printing office, occupying adjoining apartments in the same building. Besides the opportunity for instruction it furnishes it is serviceable as an adjunct of the institution, in that its workers rule and bind all the ledgers and blank books required in the various counting rooms, pad the memorandum blanks, bind and rebind library books, and accomplish much more of value in their line. The course of instruction and practice is as follows:

COURSE IN BOOKBINDING.

	Hours.
Folding stationery and printed sheets	12
Gathering	12
Sewing in for the bands	25
Sewing of books, all along and two sheets out	50
Putting on fly-leaves on print work	12
Putting on fly-leaves on blank work	37
Gluing the back	12
Cutting front fore edge	25
Rounding and backing	125
Cutting boards for covers	25
Head banding	50
Lining of the back	25
Paring of leather	25
Putting on of boards	25
Leathering of back and corners	65
Case making	25
Sliding up (paper and cloth)	25
Pasting up	25
Pressing	25
Marbling	65
Gilding	65
Red edging	65
Final examination by instructor, binding whole book	50

Under the same jurisdiction as the bindery, and in an adjoining room, is the paper box shop which ranks as a productive, as well as an instructive, industry. Here are made the boxes in which are packed the shelf goods manufactured in the hardware department and in the pipe shop. After a limited time for practice in putting together the various styles of boxes the workers are given a prescribed task, gradually increased as they become efficient. In the bookbindery, also, is taught the care and use of ruling machines.

Moulding (iron).—The foundery is a portion of the hardware manufacturing plant, and the trades class pupils in it begin to shape

articles for the market when they have been taught the first principles of moulding. Besides the foundery and its cupola there belong to the hardware plant a two story finishing shop and packing room, mill room, large storehouse, pattern safe, fan room, match room, and all the necessary machinery, tools, and appliances for transforming a piece of pig iron into a finely finished merchantable piece of shelf hardware. The product consists chiefly of shelf brackets, sad-irons, frame, side, and screw pulleys, grindstone fixtures, well wheels, casters, barrel bolts, registers, and kindred goods, the annual output being about 1,200 tons. There are 120 inmates employed in the department—50 in the foundery and 70 in the finishing shop and packing room. The moulding class has two divisions. In one the rudiments of the trade are taught. When the pupil becomes sufficiently advanced he is transferred into the foundery proper, and there receives gradually more difficult work to do, until, finally, he becomes master of the trade. Some idea of the range of practice that is gained may be formed from the statement that over 1,000 brass patterns and 500 wooden patterns are in use. The tyro in bench moulding is taught first how to keep his pattern clean, and then follow lessons in the tempering of sand, ramming the mould, placing of bottom board, drawing pattern, and pouring. This is all bench work. The same course applies to floor moulding which is taken up by the most advanced pupils before graduation. All work is subjected to the most critical examination, and when faults are discovered the pupil who is responsible for them is cautioned and instructed how to avoid them.

Hardware finishing.—In this class, in which the minimum of benefit is derived by the pupils, since the work is of a kind that requires dexterity rather than special skill, are engaged second grade men whose standing has effected their titles to more profitable instruction for the time being, and members of other grades who require absorbing employment to accustom them to persistent and quick muscular effort, and who spend a portion of their working hours acquiring an insight into some more useful vocation. There are handled in this shop as many as 50,000 small pieces of hardware a day. In the sorting, grinding, polishing, drilling, tapping, and riveting of the articles, after they have passed the mill room, the men gain familiarity with a variety of drilling machines, parallel lathes, pulley frame riveters, wire cutters and straighteners, emery wheels, sad-iron turners, chamfering hammers, bolt cutters, sad-iron handle formers and polishers, and have much practice in japanning, coppering, and bronzing.

Patternmaking.—Beginners are instructed as to the specific properties and applications of wood, and have explained to them the operations of moulding so that they may appreciate the uses of draught, halving, cores, etc. Following lessons in the care of tools and in the cutting out and turning of wood they prepare simple patterns and then engage in the more difficult exercises in which cores are used.

A frequent test in a final examination is the making of patterns in detail for turning lathes. It is by this class that the wooden patterns for the brass and iron moulders are made. The course of instruction and practice is as follows:

COURSE IN PATTERNMAKING.

	Hours.
To plane a 2 by 4 out of wind, to gauge, and square throughout	50
Practice in use of rip and cut-off saws	25
Filing saws	25
Mortising, dovetailing, and mitreing with chisel	75
Turning stick to size	12
Turning beads and gouge work	25
Turning vases and general lathe work	38
Making round core boxes	8
Bracket pattern	38
Crank pattern—combining turning and bench work	25
Small hand wheel	25
Small gear blank, curved arms	20
Small pulley	25
Spider, kettle, gem iron, etc	75
Draw handle, door latch, etc	50
Tool chest for hand lathe	25
Vise pattern	63
Engine cylinder, core boxes, valve, etc	75
Hanger pattern for line shaft	38
Detail of a speed lathe assigned by instructor	50
Globe valve pattern, T-joints and elbows	50
Final examination, general work assigned by instructor	100

Machinists.—In the machine shop, which is stocked with an assortment of engine lathes, speed lathes, planers, drills, and other metal working machinery, there are accommodations for 50 men in the two sections of the class. Preliminary to the course an explanation is given of the construction of the machines to be used and the theory of cutting tools is analyzed. The earliest work is at benches, which are supplied with vises, chisels, files, and other necessary tools. The course of instruction and practice is as follows:

COURSE FOR MACHINISTS.

	Hours.
Chipping small blocks	60
Filing and finishing small blocks	38
Filing and fitting a sliding pair	50
Scraping small surface plate	60
Scraping small valve	50
Drilling and rose-biting holes in flat iron	20
Drilling and rose-biting holes in round iron	25
Drilling and rose-biting boxes	25
Planing small surface plate	12
Planing small block	38
Planing key-ways, dovetails, slots, etc	60
General work on planer	60
Turning a cylindrical block to gauge	12
Turning a series of different sized steps on cylinder	25
Hand tooling	12

	Hours.
Finishing and polishing	12
Turning V and square thread cap screw	50
Chucking, boring, etc., of gear wheels, pulleys, etc	60
Chucking, boring, and cutting square and V threads on nuts	60
Centreing and turning an eccentric	38
Turning taper, centres, mandrels, and reamers	50
Planing small valve on shaper	25
Cutting gear wheel teeth to templet on shaper	25
Final examination, consisting of general repair work	125

All repairs to machinery about the establishment are made by the machinist class, and during the past year considerable new work has been turned out for the building constructors, a notable piece being four winding stairways leading to the new auditorium.

Iron forging.—The equipment of each learner includes a power forge, anvils, tongs, hammer, sledge, and kindred tools. The care and management of the fire is first given attention and then drawing, upsetting, forming, and welding are practised; bars of lead being used until the pupil has gained an exact idea of the proper treatment of the piece before dealing with hot iron. The intermediate exercises include such constructions as hooks, bolts, shackle, chain, swivel, hinge, tongs, etc. The course of instruction and practice is as follows:

COURSE IN IRON FORGING.

	Hours.
Drawing lead into square, octagonal, and round bars	25
Drawing lead into different forms, with sledge practice	15
Drawing iron into square, octagonal, and round bars	30
Drawing iron into different forms, with sledge practice	20
Light welding, scarf, right angle, T and butt	30
Making heavy welds, scarf, right angle, T and butt	30
Making chain, hooks, swivel, blacksmiths' tongs, etc	40
General forgings from pattern or drawing	40
Working and tempering steel	60
Making and tempering stonecutters' tools	60
Making blacksmiths' tools	90
Making machinists' tools	90
General work in forging or repair from pattern or drawing	90
Final examination:	
Blacksmiths' tools	12
Machinists' tools	12
Forging from a pattern or drawing	12

Horseshoeing.—This is an outgrowth of the forging class, and is especially designed to furnish a certain means of livelihood to a class of men who would be likely to find congenial employment in the blacksmith shops of rural districts. The first few exercises of the course are the same as those in the forging curriculum. It is when the treatment of a horse's hoof is brought under consideration that the outlines begin to vary materially. Jointed strips of wood, made to counterfeit in shape and action horses' legs, are used in teaching the methods of fitting and *calking* shoes until the pupils are accustomed to the operation. There-

after they are permitted to test their skill upon the draught stock of the reformatory. The course of instruction and practice is as follows:

COURSE IN HORSESHOEING.

	Hours.
Use of hammer in drawing and shaping lead bars	25
Drawing and shaping iron	25
Welding iron	38
Working steel	50
Making blacksmiths' tools	38
Practical work in preparing hoof for shoe	60
Calking and fitting shoes	125
Making horseshoes	150
Final examination, consisting of shoeing and repair work	125

Brass finishing.—Repairs to electrical apparatus, the manufacture of oar locks and brass trimmings for the skiffs, canoes, sailing boats, and steam launches turned out of the boat shop, and the making of all brass articles required in any of the departments of the institution, give the advanced pupils of this class an all-round experience in their trade that is of inestimable value. The equipment of the class room, in addition to the requisite hand and machine lathes, drill press, furnace, forge, milling machine, etc., includes a plating apparatus with small dynamo, and pupils are taught the methods of depositing nickel, silver, and gold plates on metals. The contribution of the class to the new auditorium is a mammoth corona supporting nearly a hundred 16-candle electric lamps, and a number of artistic electroliers. The course of instruction and practice is as follows:

COURSE IN BRASS FINISHING.

	Hours.
Oral instruction on the draught of patterns, names of files, etc	13
Filing parallel and right angle surfaces	50
Filing and fitting dovetail plugs to gauge	50
Filing and fitting small gear	25
Making, grinding, and using scrapers	25
Filing, setting, and using back-saw	25
To keep in order and use soldering-irons for soft solder	38
Gating patterns	25
Soft soldering on soft metal with blow pipe and alcohol lamp	50
Soft soldering on hard metal with blow pipe	50
Hard soldering with blow pipe	50
Hard soldering with forge	50
Annealing brass	25
Hardening brass	25
Bending brass tubing and rods	25
Hardening and tempering tools, case hardening of iron, bluing screws	63
Care, grinding, use of twist drills	25
Drilling and tapping	25
Use of hand tools on speed lathe	50
Use of wood tools on speed lathe	25
Turning to standard and hardening speed lathe centres	
Use of grinding, polishing, and buffing wheel	25
Building of a small model complete from drawing	125

Connected with the class room is a small foundery in which brass moulding is taught and where the permanent patterns for the iron foundery are made. The pupils learn the parts of the flask, the uses of the cope and drag, placing and lifting of patterns, gating of patterns, how to temper the sand, pouring, calculation of shrinkage, mixing metals, care of fire, etc. The course covers a period of six months for men who spend all their working hours in the foundery, and thereafter they have practice in making patterns in almost endless variety.

Umbrella making.—This is another of the industries which has as an object profitable production as well as instruction, and which is largely carried on by second grade men. The major portion of the umbrellas turned out are of common cambric, though some of the more experienced hands are engaged upon a finer quality of goods and have made high grades of sun umbrellas and parasols from sateens and other covering materials. The extent of the instruction afforded will be best understood by following an umbrella through its various processes. The cloth is passed in rolls to operators who single-turn hem it on each side. It is then refolded into bundles and given to the cutters, who are guided in their work by wooden patterns for each size. The gores thus formed are run up into covers by sewing machine operators. Meanwhile in another part of the shop the frames are being constructed. The ribs are first hung around by one worker, another adjusts the runner, and another the notches. The skeleton is now ready for the sticks, to which have already been affixed the cups and springs. The cover is secured to the frame, stretched, and ironed, the finishers put on the ferrules, the packers inclose the completed umbrella in paper slips and bands, and it is ready for the market. As the men engaged in these operations become proficient a stated amount of product per day is required of them, the limit being placed at such a point as shall enforce close and steady application.

Pipe making.—A number of the graduates and advanced pupils of the wood turning class find a place to put their knowledge to a fair test in the shop known as the novelty works. Wood smoking pipes of many shapes are the chief product, but there are also made umbrella sticks, with olive root, birch, and apple wood handles, for the umbrella department, and hatchet handles, lignum-vitæ and maple caster wheels, and grindstone handles for the hardware department. The workers gain experience in handling automatic turning lathes, drill presses, band and rip-saws, dowelling and sandpapering machines, and polishing wheels.

Plumbing.—When the members of this division have become pretty thoroughly posted as to the use of plumbers' tools and furnaces, the preparing of wiping cloths, making solder, soldering seams, making cup, over-cast, flange, and branch joints, etc., they are instructed as to the proper arrangement of drain, soil, and waste pipes, supply pipes, boilers, tanks, and pumps, and as to the disposal of traps and ventilators. In the class room are accommodations for practical illus-

trations of the treatment of the plumbing work used in modern tenements and factories. The course of instruction and practice is as follows:

COURSE IN PLUMBING.

	Hours.
Caulking and cutting cast iron pipe fittings	40
Making seams of sheet lead	40
Over-cast joints	40
Cup joints	40
Making S-traps	48
Wiping horizontal round joints	48
Wiping horizontal branch joints	60
Wiping upright round joints	60
Wiping upright branch joints	60
Wiping on stopcocks	40
Wiping flange joints on floor on safes	40
Wiping waste in copper lined bath tubs	40
Wiping flange on 2-inch pipe	40
Wiping on ferrule from ½ inch to 2 inches	48
Wiping joints in corners, under floors, or between joists at different angles	40
Making bends with and without sand	24
Making bottle traps	60
Wiping tanks or cisterns	40
Making safes for fixtures	40
Putting over floor in safe waste	40
Setting water-closet, wash-basin, sink, urinals, and connecting pipes necessary for same	120

Steam fitting.—The miles of pipe in the steam heating and power plant of the reformatory, with the constant demand for repairs and the connecting of new radiators, give practical employment to members of this division as rapidly as they can be advanced to a point of usefulness. In order, the instruction furnished is as follows: Cutting pipe, plain and lock-nut threads, and right and left nipples; tapping out fittings; cutting gaskets and washers for flanges, unions, etc.; packing valves with common screw stuffing box, also water glasses; packing valves with follower used in stuffing box; taking out piece of pipe and connecting with right and left coupling; taking out pipe and connecting with water union; taking out pipe and connecting with flange union; taking out pipe and connecting with lock-nut; making and placing square or right angle wall coil or pipe heater; making box coil of return bends, connecting with lock-nut to header. In learning these details the average pupil requires about 250 hours. Thereafter he fits himself for his trade by the experience afforded through general jobbing work.

Tinsmithing.—The actual practice received, after the novitiates have been taught the use of furnaces, anvils, shears, and soldering-irons, and have learned how to prepare different metals for hard and soft soldering, extends from making simple forms of pans, bowls, cups, pipe-joints, etc., to the joining of stove-pipe elbows, the making of intricate ornamental pieces, and roofing. The course of instruction and practice is as follows:

COURSE IN TINSMITHING.

	Hours.
Cutting on line with bench and hand shears	25
Marking out from pattern and cutting out work	50
Turning edge for grooving	20
The use of the grooving machine	30
Pounding down seams	10
Turning edge for wiring with turning machine	50
Use of hand wiring machine	50
Use of burring machine for turning edge for bottoms	50
Soldering seams	50
Measuring for bottoms and cutting out same	50
Turning edge for bottoms and putting on same	50
Setting down bottoms ready to double seam	50
Double seaming by hand	30
Double seaming with hand machine	40
Soldering bottoms	50
Putting on ears and bails and making the bails	40
Making rims for covers and putting on the same	30
Making dipper handles and soldering the same	40
Drawing out soldering-irons and filing and tinning same	20
Making stove-pipe	30
Making tea-kettles	50
Making boilers	75
Final examination, general jobbing	75

Barbering.—The facilities for learning how to treat crown and face hairs from the standpoint of a barber are exceptionally good, as there is constantly at hand an inexhaustible supply of subjects for experiment. The men in this class, averaging about twenty in number, shave and cut the hair of all the men in the institution as often as is needed. The barber shop is in the No. 1 trades school building, convenient to the centre of population during the working hours, and to it are marched those who need the services of the barbers. The shop is equipped with tilting barber chairs, looking glasses, and the necessary accoutrements of such an establishment. The beginners are not entrusted with razors until they have learned the principles of shaving thoroughly and have acquired the knack of a light touch through watching the movements of the instructor and the more advanced pupils. After completing the assigned course the pupil is required to shave men well at the rate of five per hour and to cut hair in any style at the rate of one head every twenty-five minutes. The course is as follows:

COURSE IN BARBERING.

	Hours.
Honing razors	36
Lathering and combing	30
Stropping	12
Shaving light beards	40
General shaving	40
Hair cutting (lay down)	40
Hair cutting (pompadour)	40
Shampooing	15
Dyeing and coloring	30
General review, consisting of any work which may come into shop	[illegible]

Tailoring.—By the members of this class, which usually numbers about half a hundred, are manufactured all the uniforms worn by inmates of all grades. The course is not intended to develop merchant tailors, but rather to give a good general idea of the trade to those who live in a locality where it is likely to be helpful. All cutting is at present done by the instructor, the pupils learning basting, hand and machine sewing, pressing and finishing of trousers, coats, waistcoats, and overcoats. In the tailor shop, too, is done the required repairing to garments of all kinds.

Shoemaking.—The manufacture and repair of all the shoes and slippers for the members of the community give to the embryo shoemakers enough practice so that no stock is wasted in experiments. For the lower first and second grade men they put together a heavy, low-cut shoe of common grade, and for members of the upper first grade and paroled men there is manufactured a lace shoe made from a good quality of stock and well finished. The course is as follows:

COURSE IN SHOEMAKING.

	Hours.
Making waxed-ends and bristling them, stitching and blindstitching	60
Square awl stitching	120
Lasting and stocking	120
Pegging and nailing	100
Heeling	75
Trimming shoes	150
Burnishing	75
Bottom finishing	100
Treeing	60
General instruction in the different kinds of leather, cutting out work, etc	60
Final examination, making shoes alone from beginning of outline to end	60

Cooking.—In an apartment adjoining the main kitchen of the establishment, and near that in which the meals of the guards and employés are prepared, are half a dozen stoves, with a profusion of pots, pans, kettles, broiling irons, etc. Here there is assembled nearly every day a class learning the science of cookery under the tutelage of the steward. In addition to acquiring a useful knowledge of plain cooking, and of the adventitious methods of making food palatable, the members are instructed in the effects of heat in different degrees upon the nutritious qualities of meats and vegetables. Many of the dishes prepared by them find places on the tables in the officers' dining room. The curriculum adhered to is as follows:

COURSE I.—BREAKFASTS.

	Hours.
Care of fires, cleaning utensils, and care of kitchen	25
Cutting meat	63
Grilling	25
Frying	38
Baking muffins and breakfast cakes	38
Preparing breakfast	13

COURSE II.—LUNCHES.

	Hours.
What and how to cook	75
Meat extracts and broth	38
Gruels and beverages	38
Principles of serving	25

COURSE III.—DINNERS.

	Hours.
Soups and bisques	50
Roasts	50
Fish	38
Vegetables	75
Pastry and cakes	100
Entrées	50
Arranging dinner	13

The baking class may properly be called a subdivision of the cooking class. Its quarters are in the basement of what is known as the domestic building, and its experience is derived chiefly through preparing the dough and baking the bread for the use of both the inmates and the officers.

Stenography.—For those men whose antecedents, expressed ambitions, education, and prospects indicate that they are adapted for a commercial career or to act as amanuenses, a well planned course in phonography is provided. The system taught is Graham's. The curriculum as arranged anticipates the graduation of shorthand writers, capable of taking dictation of ordinary business matter at the rate of at least 120 words a minute, within a year. In addition to the practice allowed in the class room, those who are capable of writing rapidly enough are furnished facilities for taking full notes of the lectures to the various school classes. Not a few of the graduates have shown their ability to maintain a speed of 150 words a minute. The order and division of the lessons is as follows:

COURSE IN STENOGRAPHY.

Consonant signs.
Joining of consonants.
Iss circle.
Word-signs.
Vocalization.
Position of words.
Vocalization of circles, etc.
Vowel word-signs.
Diphthongs.
Method of placing vowels between strokes.
Prefixes and affixes.
Brief *ways* and *yays*.
Word-signs.
Aspirates.
L, *r*, and *ish*.
L and *r* hooks.
L and *r* hooks with circles, etc.
Hook for *in*, *ler*, and *rel*.
Word-signs and contractions.
Ef, *vee*, and *en* hooks.
Shon and *tiv* hooks.
Eshon hook.
Word-signs.
Widening and doubling.
Halving principle.
Word-signs.
Omission of consonants and vowels, and joining parts of words.
Phrase writing.
Omission of words.
Enlarged *way* and *yay*.
Word-signs and dictation.

As soon as the elementary principles have been mastered the pupils are required to write from dictation at a speed commensurate with their knowledge of the code, and this is kept up until withdrawal from the class.

Typewriting.—Typewriting is so closely allied to stenography in practice that a course in the latter would scarcely be complete without ability to handle the writing machine with facility. It is but natural, therefore, that training in typewriting should be an accompaniment of a portion of the phonographic course. The pupils begin to practise on the machines when they first take up word-signs and continue until they can manipulate the keyboard at the rate of forty words or more per minute for ten minutes. The course is as follows:

COURSE IN TYPEWRITING.

Location of letters.	Miscellaneous exercises in writing from dictation.
Fingering and evenness of touch.	Technical expressions and abbreviations.
Exercises in selected words.	Speed exercises.
Forms of business correspondence, headings, titles, addresses, etc.	Mechanism, adjustment, and care of machine.
Spelling, punctuation, capitalization, etc.	

Electric lighting.—The artificial illumination of the reformatory and its surroundings is by means of about 2,300 incandescent lamps of 10 and 16-candle power, and 30 arc lamps. In each cell there is a 10-candle light, in the corridors and class rooms are many 16-candle lamps, and about the grounds and in some of the shops are 2,000-candle power arc lamps. The dynamos furnishing the powerful currents are located in a bow-roofed building constructed especially for holding them. In the plant is included a Brush arc dynamo, four incandescent dynamos, and one 90 and two 120-horse power engines. There is besides in the domestic building an emergency dynamo capable of lighting 120 16-candle lamps. The care and operation of these machines furnishes occupation and instruction usually to half a dozen men at a time. The practical experience includes stringing wires, trimming lamps, laying out and verifying wire plans, calculation of spread of light, adjustment of electric call bells, etc. Theoretical knowledge is gathered at the meetings of the class in electricity, which is a feature of the school of letters.

Mechanical drawing.—All pupils learning trades in which a knowledge of draughting is necessary or helpful have a place in the mechanical drawing class, which has on its rolls from three to four hundred names at a time. The class is divided into three sections, and each of these sections is again divided into eleven graded subdivisions containing from six to twenty learners. The work of the whole class is under the direction of a mechanical engineer, and he is assisted by a corps of inmate instructors who have completed the prescribed course and are capable of guiding others over the paths they have trodden. One sec-

tion spends every Tuesday and Friday afternoon in the drawing class room, another is there every Monday and Thursday afternoon, and the third is under instruction each week-day morning from 11 to 12 o'clock. The drawing room, which is about 125 feet long and 50 feet wide, is fitted with tilting tables at which the men stand while working on their drawing boards. The equipment includes a plentiful supply of drawing instruments, models, etc.

The outlined course provides for teaching to all members of the class the principles of working drawings, projections of planes, lines and points, geometric problems, and the use of instruments. From that point the course is specialized, and there are subdivisions for the carpenters and wood turners, for the bricklayers and plasterers, for the fresco painters and wood carvers, for the machinists, patternmakers, and blacksmiths, and for the stonecutters. The carpenters, for instance, are made familiar with the draughting of framework and joints, sections through partitions, doors and windows, framing plans of tenements, scale drawings of buildings from measurement, etc.; the iron workers learn to prepare machine details from models and sketches, to make free-hand working drawings, and to solve problems in construction; and the wood carvers and frescoers take up the elements of ornament, lines, geometric forms, leaves, and flowers, and their use in decoration.

It is well to inquire concerning the effects of manual training upon criminal dullards, as shown by the experience at the Elmira institution.

Hamilton D. Wey, M. D., physician to the Elmira reformatory, says that the criminal's wrongdoing has its origin in blunted or non-developed nervous areas [in the brain] and is indicative of wrong-headedness. Whatever may be said of the motives or incentives that led to crime, the fact remains that the head of the criminal is wrong.

To correct this abnormal mental condition should be the aim of the state in dealing with its convicted felons, and no scheme or plan has accomplished such results as those wrought by education, as comprised in letters and physical and manual training, tempered by the wholesome discipline indispensable in successful prison management.

His efforts are directed toward the awakening of dormant mental activity by stimulating peripheral nerves. These nerves, roused to action, excite corresponding areas or motor tracts in the brain to put forth their energies; and, by frequent repetition of this stimulation, the growth and development of certain cerebral centres is promoted.

Dr. Wey relates with some particularity the results of the systematic course of training to which he subjected 43 dullards at the reformatory. He had baths administered to them at frequent intervals and with regularity in conjunction with passive exercise, as kneading the muscles, working the joints, and friction applied to the entire body through rubbing by a professional trainer, as employed in the

Turkish bath; and, later in the day, a manual drill and calisthenics to furnish exercise and supplement the routine task hitherto daily performed in the shop.

To train these dullards' arms and legs to motions of precision and to act in unison, remarks Dr. Wey, was something more than muscular development and exercise in the common acceptation of the term; it was mental training as well as physical.

To the justness of this conclusion any man will subscribe who has seen a dull, shuffling lout transformed into a prompt, alert soldier through the agency of military drill.

The experiment of Dr. Wey was conducted with great care. The weight and physical measurements of each prisoner were recorded both before and after the regimen to which he was subjected. For sixteen months this line of treatment, as outlined above, was followed. At the end of that period the doctor records his conviction as follows:

Having in the line of my duties within the past year witnessed the results obtained in educational work through bodily training, I am an advocate of the employment of an instructor in physical culture, and the treatment in accordance with this plan, as a part of the educational system, in a course of not less than six months' duration, of the overgrown dunce and physically defective through malnutrition and past excesses.

Such a course might at first result in a monetary deficiency, but the improved condition of the men, and their increased capabilities for production, would in the end offset the initiatory loss.

Dr. Wey's experiment throws a powerful side light on the general question of manual training. For, if such training avails with mature and vicious men, with minds made gross and obtuse by crime, how much more effectual must the same kind of discipline prove, under happier conditions, upon the unperverted mind of youth?

The physiological argument for manual training at an early period of life is well and succinctly stated by Dr. Wey, as follows:

A large district within the brain is composed of motor centres presiding over motor ideas, and according as certain muscles are exercised and cultivated at the proper time, the growth period, the cells of gray matter comprising these motor areas are developed and multiplied. Each centre presides over its own group of muscles, and the neglect of these muscles through defective exercise and other causes will result in a weakening of that centre and a defect of the motor system. As a muscle is exercised it is made to grow, and, as it grows, it develops and strengthens the nerve centre that controls it.

The muscles of an infant, giving expression to aimless and incoordinated motion, and those of the artisan, trained to delicate manipulation, are composed of similar anatomical elements; but the difference which characterizes them resides in the nervous mechanism representing the movements of which they are capable, and not in the muscles themselves.

The motor centres of the artisan are the largest, and the cells in his

motor areas are more numerous, larger, more branched, and more widely connected with other cells.

He might have added that the unexercised brain centres remain undeveloped and in an infantile condition through life, since this is a necessary corollary. Hence, the necessity of early hand training.

CHAPTER XIV.

THE EFFECT OF MANUAL TRAINING AND TRADE INSTRUCTION UPON THE INDIVIDUAL.

CHAPTER XIV.

THE EFFECT OF MANUAL TRAINING AND TRADE INSTRUCTION UPON THE INDIVIDUAL.

As stated in the letter of transmittal the original intention of the Department, in carrying out the instructions of Congress, was to secure, on the widest possible basis, the actual results of experience in manual and trade instruction, as evidenced in the after lives of student workmen in the positions now occupied by them. This intention, for the reasons stated, has been only partially carried out. Even with much larger means at the disposal of the Department the difficulties of carrying it to any great extent were great. Manual training and trade schools in this and other countries are not in all cases in possession of information as to the location and employment of their graduates or those who have gone from their institutions to practical work; yet many such were found, and from their employers the information was sought and, in a large proportion of instances, gained. To secure the results in a uniform manner a schedule of inquiries was prepared and submitted to many experts, heads of manual training and trade schools, and, after their suggestions, adopted.

This schedule was modified for the purpose of securing the results of trade schools, and of the teaching of sewing and cooking in public schools; but the principle of the schedule remained the same throughout, the inquiries being shaped to the desired end in each class.

RESULTS OF MANUAL TRAINING SCHOOLS.

The use of the schedule relating to manual training schools resulted in securing information for 808 student workmen from the countries and the number of schools in each country shown in the following statement:

STUDENTS REPRESENTED IN THE TABULATION OF MANUAL TRAINING SCHOOLS.

Country.	Schools.	Students.
France	4	30
Germany	17	270
Norway	2	19
Russia	6	65
Sweden	15	262
Total	44	646
United States	15	162
Grand total	59	808

The tabulation of these results, exhibited in summaries, discloses, in three short tables following, the age, length of employment, the class of occupations covered, and the condition, when beginning work, of the students of manual training schools:

SUMMARY OF NUMBER, AGE, AND LENGTH OF EMPLOYMENT OF STUDENTS OF MANUAL TRAINING SCHOOLS, BY COUNTRIES.

Country.	Number reported.	Graduated from school.			Years of attendance at school of non-graduates.		Under present employer.			
							Age at beginning work.		Months employed.	
		Yes.	No.	Not reported.	Number reporting.	Average.	Number reporting.	Average (years).	Number reporting.	Average.
France	30	16	14	.....	13	1.8	30	16.3	30	63.6
Germany	270	.....	270	.....	270	1.8	269	14.3	123	12.4
Norway	19	16	3	.....	3	1.0	19	16.7	19	12.5
Russia	65	31	34	.....	31	1.4	61	16.8	65	47.1
Sweden	262	219	43	.....	21	2.1	262	17.7	262	18.7
Total	646	282	364	.....	338	1.8	641	16.1	509	23.4
United States	162	107	44	11	34	5.1	149	17.7	162	26.6
Grand total	808	389	408	11	372	2.1	790	16.4	671	24.1

SUMMARY OF OCCUPATIONS OF STUDENTS OF MANUAL TRAINING SCHOOLS, BY COUNTRIES.

Country.	Metal working.	Wood working.	Plumbing.	Painting and decorating.	Electrical work.	Stone and marble work.	Watchmaking.	Miscellaneous.	Total.
France	27	3	.....	.....	.....	.....	.....	.....	30
Germany	115	84	.....	13	.....	11	4	43	270
Norway	15	4	.....	.....	.....	.....	.....	.....	19
Russia	50	12	.....	.....	.....	.....	.....	3	65
Sweden	161	86	.....	.....	4	.....	.....	11	262
Total	368	189	.....	13	4	11	4	57	646
United States	70	26	6	9	17	1	.....	33	162
Grand total	438	215	6	22	21	12	4	90	808

SUMMARY OF CONDITION, WHEN BEGINNING WORK, OF STUDENTS OF MANUAL TRAINING SCHOOLS, BY COUNTRIES.

Country.	Number reported.	Beginning work as apprentices.			Years of apprenticeship of those beginning as apprentices.		Paid more than other beginners.			Employers prefer manual training school graduates.		
		Yes.	No.	Not reported.	Number reporting.	Average.	Yes.	No.	Not reported.	Yes.	No.	Not reported.
France	30	13	17	.....	13	3.3	14	14	2	29	1	.....
Germany	270	269	1	.....	72	3.1	1	263	6	254	14	2
Norway	19	.....	19	.....	.....	.....	18	1	.....	5	.....	14
Russia	65	10	55	.....	8	2.8	23	32	10	56	5	4
Sweden	262	6	241	15	6	2.0	212	20	30	261	.....	1
Total	646	298	333	15	99	3.1	268	330	48	605	20	21
United States	162	70	92	.....	63	3.9	48	110	4	96	57	9
Grand total	808	368	425	15	162	3.4	316	440	52	701	77	30

Digesting all the details drawn from the manual training schedule, which details it is not deemed important to print here, the economic results of manual training schools have been secured for a large number of student workmen. These results are shown in the following summarized table:

SUMMARY OF THE ECONOMIC RESULTS OF MANUAL TRAINING SCHOOLS, BY COUNTRIES.

Country.	Student workman superior to ordinary workman in—											
	Use of tools at beginning of his employment.			Increasing his skill in use of tools.			Economy in use of materials.			Planning and arranging work.		
	Yes.	No.	Not reported.	Yes.	No.	Not reported.	Yes.	No.	Not reported.	Yes.	No.	Not reported.
France	24	6	.....	24	6	.....	21	9	.....	26	4	.....
Germany	249	20	1	231	37	2	217	46	7	239	31	.....
Norway	19	.....	.....	19	.....	.....	10	4	5	16	1	2
Russia	30	35	.....	21	39	5	25	36	4	33	29	3
Sweden	249	13	.....	223	20	19	114	96	52	234	25	3
Total	571	74	1	518	102	26	387	191	68	548	90	8
United States	100	61	1	102	57	3	73	70	19	104	52	6
Grand total	671	135	2	620	159	29	460	261	87	652	142	14

Country.	Student workman superior to ordinary workman in—												
	Promise of more intelligent work.			Moral qualities.			Management of men.				Interest in employer's welfare.		
	Yes.	No.	Not reported.	Yes.	No.	Not reported.	Yes.	No.	Untried.	Not reported.	Yes.	No.	Not reported.
France	25	5	.....	25	5	.....	7	7	16	.....	9	7	14
Germany	256	13	1	54	.....	216	15	3	184	68	244	26	.....
Norway	19	.....	.....	7	6	6	3	.....	16	.....	8	7	4
Russia	54	7	4	60	3	2	12	15	34	4	12	45	8
Sweden	235	27	.....	118	103	41	49	.....	207	6	176	77	9
Total	589	52	5	264	117	265	86	25	457	78	449	162	35
United States	114	45	3	98	57	7	30	3	128	1	89	63	10
Grand total	703	97	8	362	174	272	116	28	585	79	538	225	45

This table is easily understood, and the results shown by it must be exceedingly gratifying to those who favor manual training, either in schools established especially for it or as features of the public schools. It must be recognized that in the foregoing table the facts are as to whether the student workman is superior in the various lines indicated to the ordinary workman; that is to say, looking at the first three columns of the table, it is learned that in 671 cases the student workman is superior to the ordinary workman in the use of tools at the begining of his employment, while 135 have not shown themselves to possess such superiority; or, to take the section of the table relating to economy in use of materials, out of 808 student workmen 460 proved to be superior in economy in use of materials to the ordinary workman, while 261 had not shown any such superiority, and no reports were

given for 87. Thus the table can be used throughout, and needs no further analysis.

It will be observed that there are no reports in this table for manual training schools for Great Britain. The trade school is more frequent in Great Britain than the manual training school, while the difficulty of securing the names and locations of the graduates of manual training schools or those who had gone out from them into practical work rendered it impossible for the Department to secure the desired information.

Some interesting and valuable information was obtained, through original inquiry, concerning the graduates of manual training schools for girls in France. The whole number of individual student working-women for which the facts were obtained was 50, from three schools in France; the schools, the number reported, length of employment, and condition when beginning work being shown in the two succeeding statements:

SUMMARY OF NUMBER, AGE, AND LENGTH OF EMPLOYMENT OF STUDENTS OF MANUAL TRAINING SCHOOLS FOR GIRLS, IN FRANCE.

School.	Number reported.	Graduated from school.			Years of attendance at school of non-graduates.		Under present employer.			
							Age at beginning work.		Months employed.	
		Yes.	No.	Not reported.	Number reporting.	Average.	Number reporting.	Average (years).	Number reporting.	Average.
École professionnelle, rue de Poitou.	28	28	.....	.....	.....	.....	28	16.5	28	16.3
École professionnelle, rue Bossuet.	2	2	.....	.....	.....	.....	2	17.5	2	10.5
École professionnelle et ménagère, rue Fondary.	20	14	6	.....	6	2	20	17.2	20	29.7
Total	50	44	6	.....	6	2	50	16.8	50	21.4

SUMMARY OF CONDITION, WHEN BEGINNING WORK, OF STUDENTS OF MANUAL TRAINING SCHOOLS FOR GIRLS, IN FRANCE.

School.	Number reported.	Beginning work as apprentices.			Years of apprenticeship of those beginning as apprentices.		Paid more than other beginners.			Employers prefer manual training school graduates.		
		Yes.	No.	Not reported.	Number reporting.	Average.	Yes.	No.	Not reported.	Yes.	No.	Not reported.
École professionnelle, rue de Poitou.	28	.....	28	.....	.....	.....	5	23	.....	2	26	.....
École professionnelle, rue Bossuet.	2	.....	2	.....	.....	.....	.....	2	.....	2	....	.....
École professionnelle et ménagère, rue Fondary.	20	.....	20	.....	.....	.....	5	15	.....	8	12	.....
Total	50	.....	50	.....	.....	.....	10	40	.....	12	38	.....

From the detail schedules relating to these 50 graduates of three leading schools in France a summary of economic results has been *drawn*, which is as follows:

SUMMARY OF THE ECONOMIC RESULTS OF MANUAL TRAINING SCHOOLS FOR GIRLS, IN FRANCE.

School.	Student workwoman superior to ordinary workwoman in—								
	Use of tools at beginning of her employment.	Increasing her skill in use of tools.	Economy in use of materials.	Planning and arranging work.	Promise of more intelligent work.	Moral qualities.		Management of others.	Interest in employer's welfare.
	Yes.	Yes.	Yes.	Yes.	Yes.	Yes.	Not reported.	Untried.	Yes.
École professionnelle, rue de Poitou.	28	28	28	28	28	27	1	28	28
École professionnelle, rue Bossuet.	2	2	2	2	2	2	.....	2	2
École professionnelle et ménagère, rue Fondary.	20	20	20	20	20	20	.....	20	20
Total	50	50	50	50	50	49	1	50	50

From this summarized statement it will be seen that with but one exception the student workwoman was found superior to the ordinary workwoman, whether the use of tools at the beginning of work, increased skill in the use of tools, economy in the use of materials, planning and arranging work, moral qualities, interest in the employer's welfare, or the promise of more intelligent work are considered. In the management of others the whole number had been untried. The showing, while for but a few, is of great value and thoroughly gratifying.

RESULTS OF TRADE SCHOOLS.

The prosecution of the inquiries by the Department, on the schedule indicated, for trade schools resulted in securing reports concerning 3,030 young men who had secured their equipment in trade schools. The distribution of these by countries, with the number of schools represented in each, and the number of students from each are shown in the following tabular statement:

STUDENTS REPRESENTED IN THE TABULATION OF TRADE SCHOOLS.

Country.	Schools.	Students.
Austria	73	320
Belgium	41	812
Denmark	3	121
France	18	332
Germany	4	642
Great Britain	15	126
Norway	6	103
Russia	24	216
Sweden	7	185
Switzerland	12	57
Total	203	2,914
United States	3	116
Grand total	206	3,030

The results relative to age, length of employment, occupations pursued, and condition when beginning work of the students leaving trade schools, and by countries, as shown by the tabulation of the trade school schedules, are all brought out in the three succeeding tables:

SUMMARY OF NUMBER, AGE, AND LENGTH OF EMPLOYMENT OF STUDENTS OF TRADE SCHOOLS, BY COUNTRIES.

Country.	Number reported.	Graduated from school.			Years of attendance at school of non-graduates.		Under present employer.			
							Age at beginning work.		Months employed.	
		Yes.	No.	Not reported.	Number reporting.	Average.	Number reporting.	Average (years).	Number reporting.	Average.
Austria	320	294	25	1	25	2.5	320	23.9	320	20.8
Belgium	812	401	411	.....	410	2.3	811	19.7	808	70.5
Denmark	121	98	23	.....	23	1.4	121	19.1	121	22.3
France	332	301	31	.....	31	2.5	332	16.4	329	35.1
Germany	642	.....	642	.....	642	2.0	638	17.1	635	23.1
Great Britain	126	42	67	17	43	1.8	106	18.6	87	38.2
Norway	103	54	49	.....	48	1.9	95	20.4	68	21.8
Russia	216	97	119	.....	117	2.1	216	20.3	210	38.9
Sweden	185	125	60	.....	37	1.6	184	20.2	184	20.8
Switzerland	57	44	13	.....	13	1.9	55	22.4	57	74.3
Total	2,914	1,456	1,440	18	1,389	2.1	2,878	19.3	2,819	40.3
United States	116	102	14	.....	14	1.0	112	19.0	115	14.1
Grand total	3,030	1,558	1,454	18	1,403	2.1	2,990	19.3	2,934	39.2

SUMMARY OF OCCUPATIONS OF STUDENTS OF TRADE SCHOOLS, BY COUNTRIES.

Country.	Metal working.	Wood working.	Plumbing.	Painting and decorating.	Electrical work.	Stone and marble work.	Watchmaking.	Miscellaneous.	Total.
Austria	135	73	.....	4	5	18	4	81	320
Belgium	341	50	.....	24	5	92	.....	300	812
Denmark	19	.....	.....	55	.....	.....	11	36	121
France	198	59	.....	9	1	.....	3	62	332
Germany	239	130	23	76	.....	63	3	a 99	642
Great Britain	26	7	18	.....	20	2	20	33	126
Norway	53	13	.....	12	.....	.....	.....	25	103
Russia	181	7	.....	15	1	.....	.....	12	216
Sweden	32	20	.....	47	.....	19	.....	67	185
Switzerland	8	1	.....	.....	.....	.....	32	21	57
Total	1,227	369	41	242	32	194	73	a 736	2,914
United States	.....	5	49	45	.....	8	8	1	116
Grand total	1,227	374	90	287	32	202	81	737	3,030

a Including 46 not reported.

SUMMARY OF CONDITION, WHEN BEGINNING WORK, OF STUDENTS OF TRADE SCHOOLS, BY COUNTRIES.

Country.	Number reported.	Beginning work as apprentices.			Years of apprenticeship of those beginning as apprentices.		Paid more than other beginners.			Employers prefer trade school graduates.		
		Yes.	No.	Not reported.	Number reporting.	Average.	Yes.	No.	Not reported.	Yes.	No.	Not reported.
Austria	320	28	292	.....	28	2.4	36	284	.....	207	96	17
Belgium	812	28	784	.....	14	2.9	108	694	10	725	86	1
Denmark	121	28	93	.....	28	4.6	81	38	2	119	2	.....
France	332	90	242	.....	89	2.3	120	204	8	294	37	1
Germany	642	444	174	24	109	2.9	8	627	7	614	28	.....
Great Britain	126	84	41	1	78	5.4	39	74	13	110	12	4
Norway	103	36	65	2	36	4.2	59	44	.....	49	.....	54
Russia	216	104	112	.....	94	3.3	105	110	1	184	29	3
Sweden	185	12	166	13	10	4.0	83	93	9	174	10	1
Switzerland	57	9	45	3	8	1.4	18	37	2	50	6	1
Total	2,914	863	2,008	43	494	3.4	657	2,205	52	2,526	306	82
United States	116	45	71	.....	41	3.7	81	33	2	102	12	1
Grand total	3,030	908	2,079	43	535	3.4	738	2,238	54	2,628	319	83

These tables are so brief and analytical in their construction that little text statement is needed. They are to be used in the same manner as like tables given under manual training. One or two features, however, may be given special attention. Out of the whole number only 908 began their special work as apprentices, 2,079 being ready to begin work at once, without serving any time as apprentices. In the large number of 2,628 cases out of 3,030, the employers prefer trade school graduates to those who have not had trade school training. These are very significant facts. The tables bring out other points, however, that will be found exceedingly useful in any study of the theory of trade schools.

The economic results of trade school training are easily shown in tabular form, as drawn from the details of the trade school schedule. The following table is to be used in the same way as a similar one given under manual training; that is to say, taking the first three columns, the table shows that out of the 3,030 student workmen leaving trade schools, 2,701 were found to be superior to the ordinary workman in the use of tools at the beginning of their employment, while only 324 did not have such superiority. In economy in use of materials 2,138 were superior to the ordinary workman, and 636 did not have that superiority. In planning and arranging work 2,684 out of the 3,030 exhibited superiority to the ordinary workman, and only 307 were lacking in such superiority. The other features of the table can be used in the same way.

SUMMARY OF THE ECONOMIC RESULTS OF TRADE SCHOOLS, BY COUNTRIES.

Country.	Student workman superior to ordinary workman in—											
	Use of tools at beginning of his employment.			Increasing his skill in use of tools.			Economy in use of materials.			Planning and arranging work.		
	Yes.	No.	Not reported.	Yes.	No.	Not reported.	Yes.	No.	Not reported.	Yes.	No.	Not reported.
Austria	237	82	1	238	77	5	208	110	2	224	86	.....
Belgium	798	11	3	792	15	5	757	52	3	746	55	11
Denmark	119	2	.....	115	6	.....	87	18	16	117	3	1
France	282	50	.....	285	40	7	196	45	91	295	31	6
Germany	623	19	.....	520	28	94	464	132	46	618	16	8
Great Britain	112	14	.....	113	12	1	71	15	40	115	10	1
Norway	96	6	1	100	1	2	43	50	10	101	2	.....
Russia	120	96	.....	117	89	10	99	114	3	142	69	5
Sweden	164	21	.....	158	18	9	97	63	25	168	15	2
Switzerland	54	3	.....	48	9	.....	34	13	10	51	5	1
Total	2,605	304	5	2,486	295	133	2,056	612	246	2,587	292	35
United States	96	20	.....	102	13	1	82	24	10	97	15	4
Grand total	2,701	324	5	2,588	308	134	2,138	636	256	2,684	307	39

Country.	Student workman superior to ordinary workman in—												
	Promise of more intelligent work.			Moral qualities.			Management of men.				Interest in employer's welfare.		
	Yes.	No.	Not reported.	Yes.	No.	Not reported.	Yes.	No.	Untried.	Not reported.	Yes.	No.	Not reported.
Austria	241	78	1	94	15	211	26	....	294	.....	342	78	.....
Belgium	771	34	7	726	80	6	257	81	474	.....	749	60	3
Denmark	116	5	.....	63	41	17	21	7	93	.....	95	23	3
France	302	25	5	260	63	9	42	10	278	2	222	92	18
Germany	636	4	2	19	....	623	58	21	561	2	578	55	9
Great Britain	117	7	2	94	13	19	26	3	37	60	75	16	35
Norway	95	2	6	46	37	20	10	2	73	18	62	38	3
Russia	184	29	3	181	33	2	28	30	96	62	69	128	19
Sweden	161	24	.....	83	69	33	25	3	145	12	130	45	10
Switzerland	48	3	6	43	9	5	18	3	26	10	39	9	9
Total	2,671	211	32	1,609	360	945	511	160	2,077	166	2,261	544	109
United States	102	12	2	84	26	6	38	2	75	1	96	13	2
Grand total	2,773	223	34	1,693	386	951	549	162	2,152	167	2,357	562	111

TRAINING IN SEWING AND COOKING IN THE PUBLIC SCHOOLS OF PHILADELPHIA.

The plan of the Department, under this branch of the present investigation, was to secure information from three or four of the cities in this country where training in sewing and cooking had been introduced in the public schools. The decision of the treasury department, referred to in the letter of transmittal, compelled the Department to close this branch of its inquiry when it had secured only partial information from the city of Philadelphia. It may be as well, however, for the experience of that city, one of the first to adopt the training of sewing and cooking in its public schools, is fairly typical of all other experience. In securing the information three schedules, adapted to the special needs of the case, were prepared. One comprehended

reports of teachers as to the character, accuracy of thought, planning and arranging, promise of future usefulness, etc., of the students under their charge; another embraced reports of parents along similar lines; and a third, reports of employers who had had experience with young persons who had been taught sewing in the public schools. The number of schools from which reports of teachers were obtained was 78, the whole number of students for which parents gave reports was 95, while the number of students concerning whom employers made statements was 14. These results are indeed meagre, but they are all that could be obtained at the time. The summarized statements, drawn from the three schedules described, are shown in the table which follows:

SUMMARY OF TRAINING IN SEWING AND COOKING IN THE PUBLIC SCHOOLS OF PHILADELPHIA.

REPORTS OF TEACHERS.

Number of schools reporting		78
Number whose students are taught sewing		78
Average age at beginning the study		8.6
Number whose students are taught cooking		29
Average age at beginning the study		11.6
Such training develops—		
Respect for manual labor	yes	66
	no	4
	not reported	8
Independence of character	yes	64
	no	8
	not reported	6
Accuracy of thought	yes	61
	no	9
	not reported	8
Such training develops superiority in—		
Use of materials	yes	70
	no	5
	not reported	3
Planning and arranging	yes	62
	no	8
	not reported	8
Promise of future usefulness	yes	73
	no	3
	not reported	2
Ability to earn a livelihood	yes	72
	no	1
	not reported	5
Efficient work	yes	76
	no	1
	not reported	1

REPORTS OF PARENTS.

Number of students reported		95
Number who have studied sewing		95
Average age at beginning the study		10.5
Number who have studied cooking		28
Average age at beginning the study		13.7
Such training develops—		
Respect for manual labor	yes	87
	no	3
	not reported	5
Independence of character	yes	70
	no	10
	not reported	15
Accuracy of thought	yes	68
	no	9
	not reported	18
Such training develops superiority in—		
Use of materials	yes	79
	no	8
	not reported	8
Planning and arranging	yes	75
	no	9
	not reported	11
Promise of future usefulness	yes	88
	no	4
	not reported	3
Ability to earn a livelihood	yes	45
	no	7
	untried	38
	not reported	5
Efficient work	yes	93
	no	1
	not reported	1

REPORTS OF EMPLOYERS.

Number of students reported		14
Average age at beginning work		16.4
Average number of months employed		9.7
Student workwoman superior to ordinary workwoman in—		
Attaining an average skill and efficiency	yes	14
Economy in use of materials	yes	10
	not reported	4
Planning and arranging work	yes	10
	not reported	4
Promise of future usefulness	yes	14
Interest in employer's welfare	yes	10
	not reported	4
Paid more than other beginners	yes	2
	no	11
	not reported	1
Employer prefers school trained workwomen	yes	8
	no	5
	not reported	1

CHAPTER XV.

BIBLIOGRAPHY.

CHAPTER XV.

BIBLIOGRAPHY.

The appended bibliography includes the titles of the more important works, American and foreign, relating to the subject of technical education.

The list is published in the hope that it may be of service to such as desire to supplement the study of this report by researches of their own.

UNITED STATES.

AGRICULTURAL COLLEGES AND EXPERIMENT STATIONS, PROCEEDINGS OF THE FIFTH ANNUAL CONVENTION OF THE ASSOCIATION OF. Held at Washington, D. C., August 12–18, 1891. Department of agriculture, 1892.

AGRICULTURAL EXPERIMENT STATIONS AND AGRICULTURAL SCHOOLS AND COLLEGES IN THE UNITED STATES, ORGANIZATION LISTS OF. Department of agriculture, 1890.

ART AND INDUSTRY. EDUCATION IN THE INDUSTRIAL AND FINE ARTS IN THE UNITED STATES. Part I. Drawing in Public Schools. By Isaac Edwards Clarke, A. M. United States bureau of education, 1885.

ART AND INDUSTRY. EDUCATION IN THE INDUSTRIAL AND FINE ARTS IN THE UNITED STATES. Part II. Industrial and Manual Training in Public Schools. By Isaac Edwards Clarke, A. M. United States bureau of education, 1892.

The titles of the chapters of this voluminous compilation best indicate the scope of the work:

Chapter 1. Industrial art drawing the basis of artistic and industrial education.

Chapter 2. The demand for industrial education in public schools begins.

Chapter 3. The educators themselves the leaders in educational reforms, and always the severest critics of the schools.

Chapter 4. The new departure in education in public schools.

Chapter 5. Characteristics of the new departure.

Chapter 6. Educational problems.

Chapter 7. Industrial education.

Chapter 8. An attempt to analyze and define the term, "industrial education."

Chapter 9. The direction and amount of industrial education in public schools largely dependent on local environment.

Chapter 10. Industrial education an impending necessity.

Chapter 11. Industrial education in public schools, the beginning of the movement.

Chapter 12. The experiment in Washington, District of Columbia.

Chapter 13. Experiments in some New England states.

Chapter 14. Experiments in some of the Middle states.

Chapter 15. Experiments in some of the Western states.

Chapter 16. School exhibitions.

Chapter 17. The new industrial education associations and their relations to public schools.

Chapter 18. Manual training schools as a part of the public school system.

Chapter 19. The adoption of technical manual training by the authorities of Girard College.

Chapter 20. An educational experiment, "the free kindergarten and working-man's school," founded under the auspices of the Society for Ethical Culture in New York city.

Numerous appendices.

ART EDUCATION THE TRUE INDUSTRIAL EDUCATION. By W. T. Harris, LL. D.

A paper read before the department of art education, National Educational Association, Nashville, Tennessee, July 1889.

BENCH WORK IN WOOD. By W. F. M. Goss. Ginn & Co., Boston, 1888.

A course of study and practice designed for the use of schools and colleges.

CAMBRIDGE MANUAL TRAINING SCHOOL FOR BOYS. By C. W. Parmenter. Cambridge, 1892.

COEDUCATION OF MIND AND HAND. By Charles H. Ham.

An educational monograph published by the New York College for the Training of Teachers.

COOKING SCHOOLS. By Thomas Egleston, LL. D., Columbia College.

An educational leaflet published by the New York College for the Training of Teachers.

DOMESTIC ECONOMY IN PUBLIC EDUCATION. By Mrs. E. H. Richards, instructor in sanitary chemistry, Massachusetts Institute of Technology.

This is an educational monograph published by the New York College for the Training of Teachers. The title sufficiently indicates the nature of this essay. An appendix describes what has been done in the Boston public schools, in the grammar grades of New York city, in the New York College for the Training of Teachers, in the Institute of Technology at Boston, and in the girls' schools of Paris, in the direction of teaching household sanitation, domestic economy, etc.

DOMESTIC SCIENCE IN THE SCHOOLS. By Mrs. Emma P. Ewing.

ECONOMIC ASPECTS OF INDUSTRIAL TRAINING. By Richard T. Ely, Ph. D.

EDUCATIONAL VALUE OF MANUAL TRAINING, consisting of an examination of the arguments presented in the report of the national council committee on pedagogics, at Nashville, July 1889, by Prof. C. M. Woodward; and a critical review of the same report by G. B. Morrison, of the Kansas City high school, with an appendix containing the council report in full. D. C. Heath & Co., Boston, 1890.

EDUCATIONAL VALUE OF THE TYPEWRITER IN SCHOOLS. By Wm. A. Mowry, Ph. D.

Reprinted from Education for June 1891; and recommending the use of the typewriter in teaching punctuation, spelling, capitalization, etc.

EDUCATION IN EUROPE, REPORT ON. Made to the trustees of Girard College. By A. D. Bache, LL. D. Philadelphia, 1839.

EDUCATION IN ITS RELATION TO MANUAL INDUSTRY. By Arthur MacArthur. D. Appleton & Co., New York, 1884.

EDUCATION OF THE JEWS. By H. M. Leipziger, Ph. D., director of the Hebrew Technical Institute of New York.

This is one of the series of educational monographs published by the New York College for the Training of Teachers. The monograph is in the main an adaptation of Dr. Samuel Marcus' essay entitled, *Zur Schul-Pädagogik des Talmud.*

In this little work the writer describes the system of education which has existed for twenty centuries among the Jews. It treats of (1) the importance of schools; (2) the rise and spread of schools; (3) school organization—the school-house and its arrangement; the teacher, qualifications, etc.; the pupil, school age, etc.; subjects of instruction; method, relation of instruction to life, etc.; school rules; (4) education of girls; (5) manual training.

EXTENT OF THE MANUAL TRAINING FIELD. By C. M. Woodward, Ph. D., of the Saint Louis Manual Training School.

HANDCRAFT. By James Crichton Browne, M.D., F.R.S.

This is of the educational monographs published by the New York College for the Training of Teachers. It discusses manual training from the point of view of the physiologist, demonstrating the necessity of the early exercise of the hand if it is expected that dexterity shall ever be acquired. After the fourteenth year of life (according to Dr. Browne) manual skill is rarely attainable, because the motor centres of the brain, if not responsive to tactile stimuli at that age, suffer an arrest of development and become atrophied. As a school discipline the author would restrict manual training to the two exercises, drawing and modelling.

HISTORY OF HIGHER EDUCATION IN MICHIGAN. By Andrew C. McLaughlin.

United States bureau of education circular of information No. 4, 1891.

HISTORY OF PEDAGOGY. A translation of Compayré's great work by Professor Payne of the University of Michigan. D. C. Heath & Co., Boston.

INDUSTRIAL EDUCATION. By S. G. Love. Kellogg & Co., New York, 1887.

INDUSTRIAL EDUCATION: A Pedagogic and Social Necessity. By Robert Seidel, Switzerland. Translated by Margaret K. Smith, State Normal School, Oswego, New York. D. C. Heath & Co., Boston.

This work considers the subject in the following aspects:

Chapter 1. The inner relation between industrial instruction and the social question.

Chapter 2. Errors, contradictions, and inconsistencies of the opponents of industrial instruction.

Chapter 3. The economic objections to industrial instruction.

Chapter 4. The plausible and legal objections to industrial instruction.

Chapter 5. The objections of educators and schoolmen to industrial instruction.

Chapter 6. What do the classic educators say of industrial instruction?

Chapter 7. Educational and social necessity for industrial instruction.

INDUSTRIAL EDUCATION IN THE SOUTH. By Rev. A. D. Mayo.

United States bureau of education circular of information No. 5, 1888.

INDUSTRIAL EDUCATION IN THE UNITED STATES. Special report, United States bureau of education, 1883.

INDUSTRIAL EDUCATION, REPORT OF THE COMMISSION ON. Made to the legislature of Pennsylvania, 1889.

An elaborate report on the status of industrial education at that date in the United States, France, Germany, Great Britain, Russia, Sweden, and Switzerland.

LABOR BUREAU REPORTS.

The following labor bureau reports contain textual and statistical information relating to manual and trade instruction, technical education, etc.:

California—third biennial, 1887-1888; Colorado—first biennial, 1887-1888; Iowa—first biennial, 1884-1885; Iowa—fourth biennial, 1890-1891; Kansas—fourth annual, 1888; Maryland—third biennial, 1888-1889; Massachusetts—seventeenth annual, 1886; Michigan—second annual, 1885; Michigan—sixth annual, 1889; Minnesota—second biennial, 1889-1890; Missouri—third annual, 1881; Missouri—sixth annual, 1884; Nebraska—first biennial, 1887-1888; New Jersey—sixth annual, 1883; New Jersey—seventh annual, 1884; New York—second annual, 1884; New York—fourth annual, 1886; North Carolina—second annual, 1888; Ohio—twelfth annual, 1888; Pennsylvania—second annual, 1873-'74; Pennsylvania—thirteenth annual, 1885; Pennsylvania—sixteenth annual, 1888; Rhode Island—second annual, 1888; Wisconsin—first biennial, 1883-1884.

MANUAL TRAINING, A CONFERENCE ON.

The papers read and a phonographic report of the discussions had at the sessions of a conference on manual training, held at Boston, April 8-11, 1891, to which is appended some account of the exhibits made of the methods and results of manual training, including also sewing, cooking, drawing, and the study of form and color. Edited by Mrs. Isabel C. Barrows. Published by the New England Conference of Educational Workers, Boston, 1891. Addresses, papers, and discussions on a wide range of subjects relating to manual instruction by some of the foremost educators in the United States.

MANUAL TRAINING AND THE PUBLIC SCHOOL. By Henry H. Belfield, Ph. D.

An educational monograph published by the New York College for the Training of Teachers.

MANUAL TRAINING IN THE PUBLIC SCHOOLS. By Chas. R. Richards and Henry P. O'Neil.

An educational monograph published by the New York College for the Training of Teachers.

MANUAL TRAINING IN THE PUBLIC SCHOOLS OF PHILADELPHIA. By James MacAlister.

An educational monograph published by the New York College for the Training of Teachers.

MANUAL TRAINING, OBJECTIONS TO. By Francis W. Parker.

MANUAL TRAINING SCHOOL, THE. By C. M. Woodward, Ph. D. D. C. Heath & Co., Boston, 1887.

This work was written to show how to organize and conduct the manual training school. After outlining a three years' course of study and shop exercises the author gives (Chap. V) record and testimony of graduates; (VI) what others who have seen it say of the results of manual training; (VII) the complementary nature of manual training; (VIII) the fruits of manual training; (IX) manual training a feature in general education; (X) the origin, aims, methods, and dignity of polytechnic training; (XI) manual education; (XII) extracts from the prospectus of 1879; (XIII) the province of public education; (XIV) European schools; (XV) plans, shop discipline, teachers, reports, etc.; appendices, giving courses of study in the Saint Louis and Toledo manual training schools, address of Francis A. Walker on Manual Training in the High School, and Sir Philip Magnus' essay on Manual Training in School Education.

MANUAL TRAINING THE SOLUTION OF SOCIAL AND INDUSTRIAL PROBLEMS. By Charles H. Ham. Harper & Bros., New York, 1886.

MANUAL TRAINING, TWO PAPERS ON: (1) The Intellectual Value of Tool Work. (2) The Educational Value of Manual Training. By W. T. Harris, LL. D.

Papers presented at the National Educational Association, Nashville, Tennessee, July 1889.

NATIONAL ASSOCIATION OF BUILDERS OF THE UNITED STATES OF AMERICA: OFFICIAL REPORT OF THE FIFTH ANNUAL CONVENTION. Held at New York city, February 9–14, 1891.

President's address on trade schools and subsequent discussions at the different sessions of the convention.

NATIONAL EDUCATIONAL ASSOCIATION: ADDRESSES AND PROCEEDINGS. Session of 1887, held at Chicago, Illinois.

NEW JERSEY STATE COMMISSION, REPORT OF; appointed to devise a plan for the encouragement of manufactures of ornamental and textile fabrics. Trenton, 1878.

NEW YORK COLLEGE FOR THE TRAINING OF TEACHERS.

Circular of information, 1892–'93.

PHYSICAL AND INDUSTRIAL TRAINING OF CRIMINALS. By H. D. Wey, M. D.

An account of experiments designed to awaken the intellectual faculties of criminal dullards through the agency of manual exercises, together with an exposition of the general laws of cerebral development and the educative influence of hand labor upon the motor centres of the brain, even in adult life.

An educational monograph published by the New York College for the Training of Teachers.

PLACE OF SCIENTIFIC AND TECHNICAL SCHOOLS IN AMERICAN EDUCATION. Published in Technology Quarterly, Vol. IV, No. 4, December 1891.

An address by Francis A. Walker at the convocation of the University of the State of New York, Albany, July 9, 1891.

PLEA FOR THE TRAINING OF THE HAND. By D. C. Gilman, LL. D., president of Johns Hopkins University.

An educational monograph published by the New York College for the Training of Teachers.

PSYCHOLOGY OF MANUAL TRAINING. By W. T. Harris, LL. D.

This pamphlet is a reprint from Education for May 1889. It deals with what its author deems certain fundamental errors in educational philosophy, and especially with what he regards as the fallacies and false assumptions of over zealous neophytes in educational work.

RAPPORT SUR L'INSTRUCTION PUBLIQUE À L'EXPOSITION UNIVERSELLE DE LA NOUVELLE ORLÉANS. By B. Buisson. Paris, 1886.

RINDGE GIFTS, THE.

This is the title of a small volume published by order of the city council of Cambridge, Massachusetts, in 1891, and containing a description of the Manual Training School for Boys founded in that city by Mr. F. H. Rindge.

SLOID IN THE SERVICE OF THE SCHOOL. By Dr. Otto Salomon, director of the Normal School at Nääs, Sweden.

An account of Swedish sloid by its best known exponent. The essay constitutes one of the educational monographs published by the New York College for the Training of Teachers.

SYSTEMS OF EDUCATION. By Gill. D. C. Heath & Co., Boston.

TECHNICAL EDUCATION. By Chas. B. Stetson. James R. Osgood & Co., Boston, 1874.

TECHNICAL EDUCATION. United States consular report, No. 157.

Reports from consuls of the United States at Rome, Saint Gall, Brussels, Rotterdam, and Stockholm, Saint Petersburg, Saint-Etienne, and Mentz on technical education and manual training schools.

TECHNICAL EDUCATION IN INDUSTRIAL PURSUITS. By Dr. W. T. Barnard. Baltimore, 1887.

Up to the date of its publication this report, compiled for the information of the officials of the Baltimore and Ohio railroad company, presents in a very clear and concise manner a summary of the history of industrial education at home and abroad. The subject is treated with special reference to the railroad service, and particularly to the experiment of connecting shop work with school instruction at the establishment of the Baltimore and Ohio railroad at Mount Clare. The school, unfortunately, has been discontinued.

TECHNICAL INSTRUCTION, REVIEW OF THE REPORTS OF THE BRITISH ROYAL COMMISSIONERS ON, WITH NOTES. By the late Charles O. Thompson, A. M., Ph. D., president of Rose Polytechnic Institute, Terre Haute, Indiana.

A circular of information of the bureau of education, 1885. The writer states that the object of his review of the five thick octavos of the commissioners is to extract the information which they furnish about the training of mechanical engineers and mechanics; *i. e.*, to endeavor to smelt this mass of ore and extract the metal. This essential service the accomplished author most successfully performed.

TECHNICAL INSTRUCTION. Special report of the commissioner of education to the United States House of Representatives. 1870.

TWENTY-TWO YEARS' WORK OF THE HAMPTON NORMAL AND AGRICULTURAL INSTITUTE, at Hampton, Virginia. Hampton, 1893.

An interesting record of the antecedents and post-graduate history of the negro and Indian students educated at this school.

WOOD WORKING, EXERCISES IN. By Ivan Sickels. D. Appleton & Co., New York, 1890.

WOOD WORKING, FIRST LESSONS IN. By A. G. Compton. Ivison, Blakeman & Co., New York, 1888.

WOOD WORKING TOOLS: HOW TO USE THEM. By Prof. Channing Whitaker of the Massachusetts Institute of Technology. D. C. Heath & Co., Boston.

A course of lessons in the use of the hammer, knife, axe, plane, rule, chalk-line, square, saw, gauge, chisel, and auger.

AUSTRIA.

ARBEIT ALS ERZIEHUNGSMITTEL. By Eckardt. Vienna, 1875.

ARBEITSSCHULE ALS ORGANISCHER BESTANDTEIL DER VOLKSSCHULE. By Dr. E. Schwab. Vienna, 1873.

BEDEUTUNG DER ARBEITSSCHULE FÜR SCHULERZIEHUNG. By Rissmann. Vienna, 1881.

BEOBACHTUNGEN ÜBER DIE FORTSCHRITTE AUF DEM GEBIETE DER INDUSTRIE UND DES GEWERBLICHEN UNTERRICHTS. By Leop. Fürstedler. Vienna, 1868.

BERICHT ZUR FEIER DES 25-JÄHRIGEN BESTEHENS DER KAISERLICH-KÖNIGLICHEN MECHANISCH-TECHNISCHEN LEHRWERKSTÄTTE IN KLAGENFURT. 1861–1886.

FRAUENARBEIT, ETC. Budapesth, 1874.

An account of women's work at the Vienna world's fair.

GEWERBLICHE FORTBILDUNGSSCHULEN IN DEUTSCHLAND, BELGIEN, UND DER SCHWEIZ. By K. Göck. Vienna, 1882.

GEWERBLICHER UNTERRICHT IM KÖNIGREICHE BELGIEN. By von Weigelsperg. Vienna, 1874.

HANDFERTIGKEITSUNTERRICHT IM NORDEN. By R. Petzel. Vienna, 1891.

KAISERLICH-KÖNIGLICHES TECHNOLOGISCHES GEWERBE-MUSEUM IN WIEN, 1879–1889. Vienna, 1890.

An instructive historical sketch of the foundation and development of this notable museum. The institution, which is one of the best equipped in all Europe, owes its existence to the Industrial Society of Lower Austria, whose semi-centennial anniversary was celebrated and commemorated by the publication of this account.

KUNSTGEWERBE: DIE GEWERBE- UND KUNSTGEWERBESCHULEN. By Prof. K. T. Richter. Vienna, 1869.

NATIONALE HAUSINDUSTRIE AUF DER WIENER WELTAUSTELLUNG. By Dr. Römer.

PAPP UND FEINERE HOLZARBEITEN IM HANDFERTIGKEITSUNTERRICHTE. By Dr. Theodor Gelbe. Vienna, 1892.

PROGRAMME DER VERSUCHSANSTALT FÜR ELEKTROTECHNIK.

A branch of the Technological Museum at Vienna.

PROGRAMME SÄMMTLICHER SPECIAL-LEHRCURSE AM TECHNOLOGISCHEN GEWERBE-MUSEUM IN WIEN.

SAMMLUNG VON MODELLEN.

A list of the models belonging to the Innsbruck Industrial School, specially designed for use in furniture ornamentation.

SCHULGARTEN, DER. By Dr. Erasmus Schwab. Vienna, 1870.

An epoch making book. In it the author proposed to open school gardens with vegetable beds, orchards, experiment fields, play grounds, etc., for children. The seed fell on good ground; for, says Herr Endris, "by the end of the year 1870 one could count hundreds of school gardens in Austria laid out in accordance with this plan."

SCHULWERKSTÄTTE, DIE. By A. Bruhns. Vienna, 1886.

SPECIAL-LEHRCURSE MIT ABEND- UND SONNTAGS-UNTERRICHT.

STATISTIK DES UNTERRICHTSWESENS DER HAUPTSTADT BUDAPESTH. 1888–'89.

STATISTISCHES HANDBUCH DER KÖNIGLICHEN HAUPTSTADT PRAG. 1887–'88.

TRAINING OF TEACHERS IN AUSTRIA. By E. Hannak, Ph. D., director of the Pädagogium at Vienna.

One of the most useful of the educational monographs published by the New York College for the Training of Teachers. It is a translation from the German by Edgar D. Shimer, Ph. D., assistant in pedagogy in the University of the City of New York.

"In the United States," writes the translator, "the provision made for the training of teachers is insufficient and lamentably defective." Hence, "Dr. Hannak's masterly presentation of the nature, the necessity, and the conditions of professional training for public school teachers in Austria is peculiarly pertinent to the vexed question of discriminating and synthetizing the various plans of pedagogic training now in vogue in the United States."

UEBER SCHULWERKSTÄTTEN. By Dr. E. Schwab. Vienna, 1874.

UEBER ZEICHENUNTERRICHT, KUNSTGEWERBLICHE FACHSCHULEN UND DIE ARBEITSSCHULE UND DIE VOLKSSCHULE. By Eitelberger von Edelberg. Vienna, 1883.

BELGIUM.

ADMINISTRATION DE L'ENSEIGNEMENT PRIMAIRE. Programmes de l'enseignement à donner dans les écoles normales et les sections normales primaires de l'état. Bruges.

This is the full title of a work published by the minister of the interior and of public instruction in Belgium, under an order dated February 28, 1885. In this order Minister Thonissen directs that instruction shall be given in the normal schools and in the normal sections of the primary schools of the state conformably to the programmes annexed to the present decree.

The obligatory branches include religion and morals, constitutional system of government (Belgium), pedagogy, practical didactics, notions of agriculture, hygiene of domestic animals, horticulture, arboriculture, needlework, writing, drawing, and music.

The details of the programme above outlined are given in full in this publication; and whoever wishes to understand the system of primary education which exists in Belgium should carefully study M. Thonissen's monograph.

ANNUAIRE STATISTIQUE DE LA BELGIQUE. 1889.

ANNUAIRE STATISTIQUE DE LA BELGIQUE. 1890.

ASSOCIATION POUR L'ENSEIGNEMENT PROFESSIONNEL DES FEMMES: Histoire et organisation. Brussels, 1884.

ASSOCIATION POUR L'ENSEIGNEMENT PROFESSIONNEL DES FEMMES: Vingt-cinquième anniversaire, 1865–1890. Brussels, 1890.

CATALOGUE DÉTAILLÉ DE L'EXPOSITION OFFICIELLE D'ENSEIGNEMENT PRIMAIRE. Brussels, 1884. Organized by the minister of public instruction.

ENSEIGNEMENT AGRICOLE AUX JEUNES FILLES. By Paul de Vuyst. Brussels, 1891.

Prefacing his report with an essay on the need of agricultural education for young farmers the writer takes a rapid survey of what has been done in Germany, Austria, Denmark, and Holland for the instruction of girls in the special duties of farmers' daughters. The work then gives a concise history of the organization of the Belgian system of education for farmers' daughters.

ENSEIGNEMENT DES TRAVAUX DU MÉNAGE DANS LES ÉCOLES PRIMAIRES DE FILLES ET LES ÉCOLES NORMALES D'INSTITUTRICES. Brussels, 1887.

This is a report made by A. J. Germain, director general of primary education, in July 1887, to the minister of public instruction.

The work sets forth with admirable clearness and ability the actual state of education for housekeeping in Austria, Belgium, England, France, Germany, Switzerland, and the United States.

The statistical value of this report is small, but it is full of details of the plans of instruction pursued in various cities for teaching the arts of cooking, sewing, domestic hygiene, and household economics. Hence the book must prove of great service to teachers in these branches.

ENSEIGNEMENT DES TRAVAUX MANUELS POUR GARÇONS. By Prof. van Kalken of the Brussels Normal School. Brussels, 1883.

A report to the minister of public instruction.

ENSEIGNEMENT PROFESSIONNEL DANS SES RAPPORTS AVEC L'ENSEIGNEMENT PRIMAIRE EN BELGIQUE. By M. de Ridder, professor in the University of Ghent. 1883.

ENSEIGNEMENT SPÉCIAL EN BELGIQUE. I. L'Enseignement Professionnel. By H. Bertiaux. Brussels, 1892.

The compiler of this volume proposes to himself a great work—nothing less than an account of all the institutions of learning that exist in Belgium. In the present book, however, his attention is confined to schools of technical education. Special or technical education, he says, includes three great divisions, viz., industrial education, professional education of boys and girls, and schools of domestic science (*les écoles ménagères*). Every existing Belgian school belonging to any of these categories is described in these pages.

ENSEIGNEMENT SUPÉRIEUR. By DeVaux. 1852.

Courses at the school of arts and manufactures connected with the University of Liege.

EXERCICES MÉTHODIQUES DE TRAVAUX MANUELS. By J. Boogaerts. Brussels.

The method of M. Boogaerts, which has been adopted as the standard in Brussels, Antwerp, Liege, Mons, Verviers, etc., is clearly explained in this volume. This method continues in primary education the programme of instruction begun in the kindergartens by the method of Froebel. In the one, as in the other, geometry forms the basis of evolution for all pedagogic work and exercises.

M. Sluys, director of the normal school, wrote of this method, under date of December 21, 1888, describing it as "a system of excellent exercises for developing manual skill, and for cultivating, at the same time, the taste for the beautiful."

GEWERBLICHE ERZIEHUNG DURCH SCHULEN, LEHRWERKSTÄTTEN, MUSEEN UND VEREINE IM KÖNIGREICH BELGIEN. Part I. Industrial Art. By Carl Genauck. Reichenberg, 1886.

INFLUENCE DE L'ENSEIGNEMENT SUR LA PROSPÉRITÉ INDUSTRIELLE ET COMMERCIALE. By Eugene Gauthy. 1860.

MANUAL TRAINING IN ELEMENTARY SCHOOLS FOR BOYS. By Prof. A. Sluys of the Brussels Normal School.

This is one of the educational monographs published by the New York College for the Training of Teachers.

MANUEL DES SCIENCES COMMERCIALES. Used in the Brussels École Industrielle.

MODELAGE SCOLAIRE. By Stepman and Calozet. Brussels, 1891.

NOTICE SUR LES INSTITUTIONS ET SERVICES DES ETABLISSEMENTS COCKERILL. Liege, 1889.

PROGRAMME DE L'ENSEIGNEMENT À DONNER DANS LES ÉCOLES PRIMAIRES COMMUNALES. Ostend, 1888.

RAPPORTS SUR LES MUSÉES ET LES ÉCOLES D'ART INDUSTRIEL EN BELGIQUE ET HOLLANDE. By M. Vachon. Paris, 1888.

RAPPORT SUR LA SITUATION DE L'ENSEIGNEMENT INDUSTRIEL ET PROFESSIONNEL EN BELGIQUE, PRÉSENTÉ AUX CHAMBRES LÉGISLATIVES, May 7, 1886. By the minister of agriculture, industry, and public works. Brussels, 1886.

REVUE UNIVERSITAIRE, Brussels. Monthly parts, March 1891 to April 1892, inclusive.

TROISIÈME BULLETIN DE LA SOCIÉTÉ NATIONALE DE TRAVAIL MANUEL. Congrès international de Bruxelles, August 30 and 31, 1891.

A report of the proceedings and discussions at the Brussels congress, together with a list of the members of the Belgian Society of Manual Training. The president, M. Calozet, refers to the years 1878 to 1882 as "the period of purely theoretical discussion" of manual training; from 1882 to 1885 as "the period of

groping;" from 1885 to 1887 as "the period of practical experiment." Now, he observes, "we possess a true national system of manual training."

FRANCE.

ANNUAIRE DE L'INSTRUCTION PUBLIQUE, DES CULTES ET DES BEAUX ARTS. Paris, 1888.

ANNUAIRE STATISTIQUE DE LA FRANCE. 1890.

ANNUAIRE STATISTIQUE DE LA VILLE DE PARIS. 1886.

APPRENTICESHIP SCHOOLS IN FRANCE. By Silvanus P. Thompson. London, 1879.

CODE DE L'ENSEIGNEMENT PRIMAIRE. By E. de Resbecq. Paris, 1887.

COURS D'ÉCONOMIE DOMESTIQUE. By Mlle. Marchef-Girard. Paris.

A book designed for the use of lyceums, colleges, normal schools, advanced primary schools, etc.

COURS D'ENSEIGNEMENT COMMERCIAL (CLASSES DU SOIR) INSTITUÉS DANS LES ÉCOLES COMMUNALES DE LA VILLE DE PARIS. 1890.

COURS NORMAL DE TRAVAIL MANUEL. By P. Martin. Paris, 1888.

ÉCOLE, L'. By Jules Simon. Paris, 1886.

ÉCOLES D'ENSEIGNEMENT PRIMAIRE SUPÉRIEUR. Historique et législation. Paris, 1886.

ÉCOLES MANUELLES D'APPRENTISSAGE ET ÉCOLES PROFESSIONNELLES. Paris, 1887.

ÉMILE. (The Ideal Education for a Boy.) By Rousseau. (In English.) Boston, 1886.

ENSEIGNEMENT COMMERCIAL ET LES ÉCOLES DE COMMERCE EN FRANCE ET DANS LE MONDE ENTIER. By Eugene Leautey. Paris, 1886.

ENSEIGNEMENT DE L'AGRICULTURE. Paris, 1887.

ENSEIGNEMENT DU TRAVAIL MANUEL À L'ÉCOLE PRIMAIRE. By Émile Faivre. Paris, 1887.

ENSEIGNEMENT PRIMAIRE. Paris, 1886.

This is a résumé of the discussions relative to manual training and the reorganization of the school system of France, in the French senate and chamber of deputies.

ENSEIGNEMENT PRIMAIRE À PARIS, DE 1867 À 1877. By M. Gréard.

In this report a list of former pupils of the Paris apprenticeship school is given with their ages, occupations, places of employment, and salaries. The exhibit is most favorable to the school.

ENSEIGNEMENT PRIMAIRE ET APPRENTISSAGE. By G. Salicis. Paris, 1878.

ENSEIGNEMENT PROFESSIONNEL. By A. Corbon. Paris.

FRANCE AS IT IS. By Lebon and Pelet. London, Paris, and New York, 1888.

FUTURE MÉNAGÈRE, LA. By Mlle. Ernestine Wirth. Paris.

The housekeeper of the future will be thoroughly equipped for her duties if she learns all that is contained in these lectures on domestic economy, household science, hygiene, etc. For school use.

GRANDES ÉCOLES DE FRANCE, LES. By Mortimer D'Ocagne. Paris, 1887.

GUIDE PRATIQUE DES TRAVAUX MANUELS. By G. Dumont and G. Philippon. Paris.

HISTOIRE DES ÉCOLES IMPÉRIALES D'ARTS ET MÉTIERS. Liancourt, Compiègne, Beaupréau, Châlons, Angers, Aix. By A. Guettier. 1865.

INSTRUCTION SPÉCIALE SUR L'ENSEIGNEMENT DU DESSIN. Paris.

INSTRUCTION SPÉCIALE SUR L'ENSEIGNEMENT DU TRAVAIL MANUEL DANS LES ÉCOLES NORMALES D'INSTITUTEURS ET LES ÉCOLES PRIMAIRES, ÉLÉMENTAIRES ET SUPÉRIEURES. Paris, 1886.

MANUAL TRAINING IN FRANCE. By A. Salicis, late inspector general of manual training in France.

This work is translated from the author's manuscript by B. D. Woodward, of Columbia College, and published as an educational monograph, in May 1890, by the New York College for the Training of Teachers.

MEMOIRE SUR LES ÉCOLES D'APPRENTIS. By M. Gréard. 1871.

MÉTHODE DE COUPE ET D'ASSEMBLAGE POUR ROBES DE FEMMES, VÊTEMENTS D'ENFANTS, ETC. By Mme. G. Schéfer. 1891.

Used in the Paris schools.

ORGANISATION DES ÉCOLES PRATIQUES PROFESSIONNELLES EN ALLEMAGNE, EN SUÈDE ET EN RUSSIE, ETC. By Van der Corput. Paris, 1866.

PREMIÈRE ANNÉE D'ÉCONOMIE DOMESTIQUE, LA. By R. El. Chalamet. Paris.

This first year book is for pupils' use; an advanced work for teachers is in preparation by the same author.

PROFESSIONS ET MÉTIERS: Guide pratique pour le choix d'une carrière à l'usage des familles et de la jeunesse. Paris.

This work is projected on a most liberal scale, and, when finished, it will constitute a complete treatise on the professions (*manuelles, industrielles, et commerciales*). It is published in parts, and treats the various subjects comprised within its scope in alphabetical order. The 48th part brings the work down to *Fleurs Artificielles*. As in other cases a concise historical sketch of this industry is first given, followed by some statistics of the importance of the business, and a list of the principal centres of the manufacture. Fifteen thousand persons are said to have been engaged in this industry, in 1890, in Paris alone, and 30,000 more in the province. The treatise issued under the supervision of M. Paul Jacquemart, inspector general of technical education, is to be a cyclopædia of the trades and professions.

RAPPORT SUR LA CRÉATION D'ÉCOLES D'APPRENTISSAGE. By H. Tolain, senator. Paris, 1883.

SOCIÉTÉ POUR L'ENSEIGNEMENT PROFESSIONNEL DES FEMMES. (Écoles Élisa Lemonnier.) 1891.

STATISTIQUE DE L'ENSEIGNEMENT PRIMAIRE. Paris.

TECHNICAL EDUCATION IN EUROPE. First part: Industrial Education in France. By J. Schoenhof, consul at Tunstall. 1888.

Published by the United States department of state, and containing a detailed account of the French system of industrial and technical education, the commercial schools, art schools, and industrial art museums of France.

TRAVAIL MANUEL. By Victor Brudenne. Paris, 1887.

TRAVAIL MANUEL À L'ÉCOLE DE LA RUE TOURNEFORT. By D. Laubier and A. Bougueret. Paris, 1888.

TRAVAIL MANUEL À L'ÉCOLE ET DANS LA FAMILLE. By Bertrand and Toussaint (school inspectors), and I. Gombert (school director). Paris, 1890.

This book comprises lessons in folding, weaving, paper and pasteboard cutting, braiding of threads, straw, etc., cutting out of patterns, basket weaving, iron and wood work, and clay modelling. The last mentioned branch of construction work is of special interest, and among the 524 illustrations of this volume there are none more pleasing than those of clay models of eggs, plates, books, bottles, inkstands, hats, shoes, apples, leaves, flowers, and other objects, such as children from 5 to 10 years of age can be taught to make. The work contains within the compass of 200 pages explicit instructions for making each of the articles named.

TRAVAUX MANUELS ET ÉCONOMIE DOMESTIQUE. By Mmes. G. Schéfer and Sophie Amis. 1889.

Used as a text book in the primary and normal schools.

TROIS ÉCOLES NATIONALES PROFESSIONNELLES, LES. Paris, 1888.

ÜBER POLYTECHNISCHE INSTITUTE IM ALLGEMEINEN UND ANSTALTEN FÜR TECHNISCHE BILDUNG IN FRANKREICH. By Dr. F. B. Hermann. Nuremberg, 1828.

VISIT TO A FRENCH TRAINING COLLEGE.

An educational leaflet published by the New York College for the Training of Teachers, describing a visit to *L'École Normale d'Auteuil.*

VOLKSSCHULE UND DER GEWERBLICHE UNTERRICHT IN FRANKREICH, MIT BESONDERER BERÜCKSICHTIGUNG DES SCHULWESENS VON PARIS, is the full title of a valuable monograph by Dr. Max Weigert of Berlin. 1890.

GERMANY.

ACHTER JAHRESBERICHT ÜBER DIE BERLINER FORTBILDUNGSSCHULEN, 1890–'91.

AMEISENBÜCHLEIN. By Salzmann.

ANLEITUNG ZUR KERBSCHNITZEREI. (42 illustrations of the text.) By Clara Roth. Leipsic, 1890.

ANLEITUNG ZUR KERBSCHNITZEREI. By G. Vollers. Hamburg, 1890.

ANWEISUNG ZUM MODELLIEREN AUS PAPIER. By Rockstroh. Weimar, 1802.

ARBEITSFRAGE, DIE. By F. G. Schulze. Jena, 1849.

ARBEITSSCHULE ALS ORGANISCHER BESTANDTHEIL DER VOLKSSCHULE. By Erasmus Schwab.

ARBEITSSCHULE NEBEN DER LERNSCHULE UND DER HÄUSLICHE GEWERBEFLEISS. By Clauson-Kaas. Berlin, 1876.

ARBEITSSCHULEN UND HAUSFLEISSVEREINE. By Raydt. 1879.

ARBEITS-UNTERRICHT AUF DEM LANDE. By E. von Schenckendorff. Görlitz, 1891.

Manual training in the country encounters obstacles of much the same kind everywhere, and the discussion in this pamphlet embraces subjects of common interest in Germany and in the United States.

The writer treats the question under four heads: (1) What do the promoters of manual training seek? (2) Manual instruction in the country. (3) A further reform of the country school. (4) Distribution of the cost of manual instruction. To check the congestion of the cities, to stay the depopulation of the country regions, and prevent this acute disease of the time, which is becoming more and more a public calamity, Herr Schenckendorff's panacea is manual training. "Agriculture," he says, "is the most extensive industry in the country, so highly developed and extended as to outweigh all other interests." Hence he pleads for such schools in the country as will educate boys to become farmers.

ARBEITSUNTERRICHT IM AUSLANDE UND IN DEUTSCHLAND, SEINE WIRTSCHAFTLICHE UND NATIONALE BEDEUTUNG. By Dr. Woldemar Götze. Leipsic, 1892.

AUS DER LEHRERBILDUNGSANSTALT DES DEUTSCHEN VEREINS FÜR KNABENHANDARBEIT. Leipsic.

A series of practical lectures on manual exercises in metal work for pupils and teachers; with a report concerning the teachers' school workshop in 1891.

BEDEUTUNG DES KUNSTGEWERBLICHEN UNTERRICHTS FÜR WÜRTTEMBERG. By Prof. Bäumer. Stuttgart, 1870.

BELUSTIGUNGEN FÜR DIE JUGEND BEIDERLEI GESCHLECHTS, DURCH SELBSTANFERTIGUNG MANNIGFACHER TECHNISCHER KÜNSTELEIEN UND SPIELWERKE. By Rockstroh. Berlin, 1836.

BERICHT ÜBER DEN STAND UND DIE AUSBREITUNG DES ARBEITSUNTERRICHTS IN DEUTSCHLAND. By Th. Sonntag. Leipsic, 1889.

BERICHT ÜBER DIE THÄTIGKEIT DES VEREINS FÜR KNABENHANDARBEIT ZU DANTZIG FÜR DAS ERSTE VEREINSJAHR. 1889–'90.

BILDERWERKSTATT (Manual Practice for Youth, the School, the Home). By Dr. Georgens. 1857.

DENKSCHRIFT BETREFFEND DIE ERRICHTUNG EINER ZWEITEN HANDWERKERSCHULE. Berlin, 1890.

DENKSCHRIFTEN ÜBER DIE ENTWICKELUNG DER GEWERBLICHEN FACHSCHULEN UND DER FORTBILDUNGSSCHULEN IN PREUSSEN WÄHREND DER JAHRE 1879 BIS 1890. By Herr Lüders. Berlin, 1891.

In this work of 318 pages the author recites the history of 52 trade and continuation schools of Prussia. These schools have all been established within a recent period at various points in the kingdom and they are of diverse characteristics, some being schools of industrial drawing, others building trade schools, art schools, schools of the metal industries, artisans' and laborers' schools, master workmen's schools, weaving schools, schools for locksmiths, machinists, etc. A concise description of each school is given, together with the statistics of attendance, expenditure, etc.

DEUTSCHEN KNABEN HANDWERKSBUCH, DES. By Barth and Niederly. 1879.

DEUTSCHE SCHULE UND DEUTSCHES GEWERBE. By Dr. Th. Hermann. Dresden, 1880.

EDUCATION IN BAVARIA. By Sir Philip Magnus, director of the City and Guilds of London Institute.

This is one of the educational monographs published by the New York College for the Training of Teachers.

EIN GESUNDER GEIST IN EINEM GESUNDEN KÖRPER. By H. Raydt. Hanover, 1889.

The book treats of the correlation of bodily health and mental vigor. It especially emphasizes the hygienic value of exercise, games, etc., to the growing child, and the importance of manual training as a means of intellectual development.

ENSEIGNEMENT MANUEL ET PROFESSIONNEL EN ALLEMAGNE. By G. Salicis and G. Jost. Paris, 1887.

ENTSTEHUNG UND ENTWICKLUNG DER GEWERBLICHEN FORTBILDUNGSSCHULEN UND FRAUENARBEITSSCHULEN IN WÜRTTEMBERG. 1889. Published by the royal commission.

ERGÄNZUNG DES SCHULUNTERRICHTS DURCH PRAKTISCHE BESCHÄFTIGUNG. By Götze. Leipsic, 1880.

ERZIEHUNG ZUR ARBEIT. By Karl Friedrich (the pseudonym of Prof. K. Biedermann). Leipsic, 1852.

One of the earliest, as it is still one of the best, publications on this subject. Though written more than forty years ago it advocates the introduction of hand training in schools on the same ground now urged in favor of its adoption, *i. e.*, on account of its educational usefulness, not for any industrial end. Prof. Biedermann still lives and labors for the success of the cause which he has always sought to promote.

ERZIEHUNG ZUR ARBEIT, EINE FORDERUNG DER ZEIT. By A. Endris. Leipsic, 1888.

A history of the development of modern educational ideas and methods, including the relation which the demand for manual training bears to pedagogics, and what pedagogical authorities of ancient and modern times say of this demand.

FORTBILDUNGSSCHULE IN UNSERER ZEIT, DIE. By Prof. J. B. Meyer. Berlin, 1873.

FRAUENARBEITSSCHULE IN REUTLINGEN, DIE. By Rector Reiniger. Reutlingen, 1881.

FRAUENARBEITSSCHULE IN REUTLINGEN, DIE. Ihre Entsehung und ihre Wirksamkeit. By M. Z. Reutlingen, 1873.

GERMAN BOY'S EXPERIMENT BOOK, THE. By Emsmann and Dammer. Leipsic, 1881.

GESCHICHTE DER ARBEIT UND KULTUR. By Kirchmann. Leipsic, 1858.

GESCHICHTE DER METHODIK DES DEUTSCHEN VOLKSSCHULUNTERRICHTS. By Dr. C. Kehr. Gotha, 1889.

GESCHICHTE DES ARBEITSUNTERRICHTES IN DEUTSCHLAND. By Rissmann. Gotha, 1882.

GESCHICHTLICHE ENTWICKELUNG DES HANDFERTIGKEITS-UNTERRICHTS. By Johannes Meyer.

GEWERBESCHULWESEN, DAS. By Carl Melchior.

GEWERBE UND SCHULE. By E. Wilda. Brünn, 1882.

GEWERBLICHE ERZIEHUNG DURCH SCHULEN, LEHRWERKSTÄTTEN, MUSEEN UND VEREINE IM KÖNIGREICH WÜRTTEMBERG. By Carl Genauck. Reichenberg, 1882.

GEWERBLICHE FORTBILDUNGSSCHULEN. By H. Grunow. Weimar, 1867.

GEWERBLICHE FORTBILDUNGSSCHULEN DEUTSCHLANDS. By Dr. R. Nagel. Eisenach, 1877.

GEWERBLICHER UNTERRICHT IN WÜRTTEMBERG. By Prof. Genauck. 1882.

The status of industrial instruction in the kingdom of Würtemberg at the above date is very fully defined in this work.

HANDARBEIT IN DER KNABENSCHULE. By Hanschmann. 1876.

HANDARBEITSUNTERRICHT. By Schallenfeld. Frankfort, 1861.

HANDARBEITSUNTERRICHT AN DEN STÄDTISCHEN VOLKSSCHULEN. (Anonymous.) Strasburg.

HANDARBEITS-UNTERRICHT FÜR DIE MÄNNLICHE JUGEND. By Urban, May, Bauhofer, and Kreibich.

HANDARBEITSUNTERRICHT IN DEN MÄDCHENSCHULEN WÜRTTEMBERGS. By E. Hory. Stuttgart, 1872.

HANDARBEIT UND HAUSFLEISS. By Herzfeld. Hanover, 1881.

HANDBILDUNG UND HAUSFLEISS. By Lammers. Berlin, 1881.

Herr Lammers is editor of the *Nord-West*, the organ of the central committee of manual training.

HANDFERTIGKEITS-UNTERRICHT. By Rauscher.

HANDFERTIGKEITS-UNTERRICHT. By Rudolf Petzel.

HANDFERTIGKEITSUNTERRICHT FÜR KNABEN. By Herse. 1882.

HANDFERTIGKEITSUNTERRICHT IN DER BLINDENSCHULE. By Gustav Görner, teacher in the Leipsic Institute for the Blind.

HANDFERTIGKEITS-UNTERRICHT UND DIE HÖHEREN SCHULEN. By Höhn.

HANDFERTIGKEITSUNTERRICHT UND DIE SCHULE. By Meyer. Berlin, 1881.

HANDFERTIGKEIT UND SCHULE. By Kreyenberg. Frankfort.

HANDWERKERSCHULEN, DIE LANDESBAUGEWERKSCHULE, UND DIE KUNSTGEWERBESCHULEN IM GROSS-HERZOGTHUM HESSEN. By F. Fink.

A history of the development of the artisans' schools, the farm work school, and the schools of industrial art in the grand duchy of Hesse, from the year 1837; and their condition in 1886.

HAUSHALTUNGSKUNDE IN DER DORFSCHULE UND IHRE STELLUNG ZU DEM UNTERRICHT IN DEN WEIBLICHEN HANDARBEITEN. By Maria Rebe. Gotha.

HÖHERER POLYTECHNISCHER UNTERRICHT IN DEUTSCHLAND, IN DER SCHWEIZ, IN FRANKREICH, BELGIEN, UND ENGLAND. By Carl Koristka. Gotha.

HOUSEHOLD INDUSTRY AND THE EMDEN COURSE OF MANUAL TRAINING AS CONDUCTED BY CLAUSON-KAAS. (German.) By Gustav Oelshorn. Leipsic.

ILLUSTRIERTES SPIELBUCH FÜR KNABEN. By Herman Wagner. Leipsic.

This book for boys contains 1,001 games and 533 illustrations.

ILLUSTRIERTES SPIELBUCH FÜR MÄDCHEN. By Marie Leske. Leipsic.

A book of 1,500 recreations, games, and exercises for body and mind, in the house and out of doors; with 500 illustrations.

INDUSTRIELLE ENTWICKLUNG IM KÖNIGREICH WÜRTTEMBERG, ETC. By L. Vischer. Stuttgart, 1875.

INDUSTRIE UND SCHULE. By A. Tylor. Stuttgart, 1865.

JUNGE KERBSCHNITZER, DER. By Max Schmiedel. Leipsic, 1891.

A book of patterns for advanced wood working pupils with explanatory text.

JUNGE LAUBSÄGEARBEITER, DER. By Carl Freyer. Leipsic.

This author gives (in 12 sections) full instructions, not only for scroll sawing, but for carving, mosaic work, wood painting, etching, etc.

JUNGE TECHNIKER, DER. By Emsmann and Dammer. Leipsic, 1876.

KERBSCHNITT, DER. (35 pattern sheets with explanatory text.) By Prof. I. Koch. Carlsruhe, 1890.

KINDES ERSTES BESCHÄFTIGUNGSBUCH, DES. By Barth and Niederly. Leipsic, 1880.

KLEINE RELIEF-ARBEITER, DER. By Wiget. Zurich, 1881.

KLEINGEWERBE UND DER GEWERBLICHE UNTERRICHT. By Prof. Ed. Tobisch. Reichenberg, 1872.

KNABENARBEITSSCHULE ZU DARMSTADT. 1841.

KREBSBÜCHLEIN. By Salzmann.

KUNSTGEWERBE ALS BERUF. By Dr. Julius Lessing. Berlin, 1891.

KURZE ANWEISUNG IM LINEARZEICHNEN FÜR VOLKS- UND ARBEITSSCHULEN. By O. Salomon. Gothenburg, 1876.

LAUBSÄGEARBEITER, DER. By Hugo Elm. Leipsic.

An illustrated introduction to the practice of fret-sawing.

LAUBSÄGEREI SOWIE DIE EINLEGE- UND SCHNITZARBEIT. By Walleneg.

LEVANA. (The Doctrine of Education.) J. P. Richter. (In English.) Boston, 1886.

MEHR ERZIEHUNG FÜR DIE DEUTSCHE JUGEND. By H. Raydt. C. Mantz, Hanover-Linden, 1890.

MENSCHLICHE ERNÄHRUNG UND DIE CULTURHISTORICHE ENTWICKLUNG DER KOCHKUNST. By Frau Lina Morgenstern. Berlin, 1882.

MODELLIEREN UND ZEICHNEN IN DER BLINDENSCHULE. By S. Heller. Düren, 1890.

MUSTERBUCH FÜR KUNSTARBEITEN. By Ortleb. Leipsic.

NERVOSITÄT UND MÄDCHENERZIEHUNG IN SCHULE UND HAUS. By Herr Afer. J. F. Bergmann, Wiesbaden, 1891.

A valuable book on one of the most perplexing of modern school problems, viz., the education of girls without impairment of the health.

Within the compass of 106 pages the author, who is connected with the Girls' High School at Altenburg, discusses in a thoroughly practical way the causes of nervousness, the importance of recognizing its early manifestations, the influence of study, the effects of examinations, of manual training, and of housework, gives advice concerning holidays, Sundays, private reading, piano playing, the duration of the school period, misuse of schooling, the supervision of schools and school systems by joint committees of teachers and physicians, etc.

NOCH ETWAS ÜBER ERZIEHUNG. By Salzmann. Leipsic.

PAPPARBEITER, DER. By Hugo Elm.

An illustrated guide for making pasteboard work of all kinds (building of card boxes, doll houses, etc.).

PRAKTISCHE ANWEISUNG ZUR ERTEILUNG DES HANDARBEITSUNTERRICHTS NACH DER METHODE VON AGNES SCHALLENFELD. By Agnes Schallenfeld. Frankfort-on-the-Main.

PRAKTISCHER UNTERRICHT EINE FORDERUNG DES LEBENS AN DIE SCHULE. By E. von Schenckendorff. Breslau, 1880.

PRAKTISCHES HAUSBUCH. By N. C. Rom. Leipsic, 1890.

This is a work on wood carving.

REFORM DER VOLKSSCHULE. By Herr Curtmann. Frankfort, 1851.

REFORM DER VOLKSSCHULE. By J. Schäppi.

REPORTS ON THE WORK OF THE GERMAN SOCIETY OF MANUAL TRAINING; and on the normal school under the management of this society for 1888, 1889, and 1890 (the last on the teachers' courses at Leipsic), by Dr. W. Götze, are of great value.

SCHULKONFERENZ, UND DIE KÜNFTIGE GESTALTUNG DES HÖHEREN SCHULWESENS VOM SOZIALPOLITISCHEN STANDPUNKT. By E. von Schenckendorff. Berlin, 1891.

SCHULWERKSTATT, DIE. By Barth and Niederly. Leipsic, 1882.

A guide for the introduction of technical exercises into the school; with 103 illustrations.

SCHULWERKSTÄTTE IN IHRER VERBINDUNG MIT DEM THEORETISCHEN UNTERRICHT, DIE. By Bruhns.

SEELE UND HAND. By Th. Pietsch.

STATISTIK DES UNTERRICHTS- UND ERZIEHUNGSWESENS IM KÖNIGREICH WÜRTTEMBERG. 1889–'90.

STELLUNG DES HANDARBEITSUNTERRICHTS IN DER SCHULE, UND SEINE BEDEUTUNG FÜR SCHULE UND LEBEN. By Anna Christiani. Bielefeld, 1892.

STUDIEN ZUR HAUSWIRTHSCHAFT. By Frau Lina Morgenstern. Berlin.

ÜBER DIE EINRICHTUNG VON REAL- UND GEWERBESCHULEN MIT BESONDERER RÜCKSICHT AUF HEILBRONN. By Prof. H. C. Kapff. Heilbronn, 1834.

ÜBER DIE ERRICHTUNG EINER HÜTTENMANNISCHEN LEHRANSTALT IN OBER-SCHLESIEN. By A. Huyssen. Breslau, 1863.

ÜBER GEWERBESCHULEN UND IHRE EINRICHTUNG IN WÜRTTEMBERG. By Prof. F. L. Finckh. Stuttgart, 1829.

ÜBER TECHNISCHE LEHRANSTALTEN IN IHREM ZUSAMMENHANG MIT DEM GESAMMTEN UNTERRICHTSWESEN. By Dr. C. F. Nebenius. Carlsruhe, 1833.

UEBER ARBEITSSCHULEN UND FÖRDERUNG DES HAUSFLEISSES. By Clauson-Kaas. Bremen, 1881.

UEBER DIE VERBINDUNG DER PRAKTISCHEN ARBEIT MIT DER LERNSCHULE. By Clauson-Kaas. Dresden, 1875.

UEBER DIE ZIELE DES DEUTSCHEN VEREINS FÜR KNABENHANDARBEIT. By E. von Schenckendorff. Bielefeld, 1892.

UEBER ERZIEHUNG ZUR ARBEIT, INSBESONDERE IN ANSTALTEN. By Wichern. Hamburg, 1867.

UEBER HANDFERTIGKEITSUNTERRICHT UND HAUSFLEISS. By Wolf. Würzburg, 1881.

UNNATUR DER MODERNEN SCHULE, DIE. By H. Wigge and P. Martin. Robt. Oppenheim, Berlin, 1889.

VERHANDLUNGEN, ETC. Proceedings of the congress of manual training and household industry. By Götze. Gera.

VERWALTUNGSBERICHT DES RATHES DER KÖNIGLICHEN HAUPT- UND RESIDENZSTADT DRESDEN FÜR DAS JAHR 1890. Dresden, 1892.

VIERTER JAHRESBERICHT DES HAUPTVEREINS FÜR KNABEN-HANDARBEIT ZU BERLIN, 1890–'91.

VOLKSGEWERBSCHULE. By Fr. Rücklin. Leipsic, 1888.

VOLKSSCHULWESEN IN WÜRTTEMBERG. By K. H. von Stirm, D. D. Gotha, 1873.

WAHRNEHMUNGEN UND GEDANKEN UEBER TECHNISCHE-GEWERBLICHES SCHULWESEN. By Wilda. Leipsic, 1879.

WERKSTÄTTE DER KINDER. In 4 parts. By Blasche. 1800–1802.

The titles of other works of this author (turned into English) are: The Industrial Education of Youth and the Youth's Technological Friend, published in 1804; New Patterns of Pasteboard Work, 1809; The Pasteboard Worker, 1811; The Paper Worker, 1819; Handbook of Children's Occupations.

WESEN UND WERT DER SCHULWERKSTÄTTE. By Illing. Munich, 1880.

ZWEITER BERICHT ÜBER DIE GESAMMTEN UNTERRICHTS- UND ERZIEHUNGS-ANSTALTEN IM KÖNIGREICHE SACHSEN. 1889.

GREAT BRITAIN.

CITY OF MANCHESTER TECHNICAL INSTRUCTION COMMITTEE. Report of deputation appointed to visit educational institutions and schools on the continent. October 1891. J. E. Cornish, publisher, Manchester.

DIRECTORY WITH REGULATIONS FOR ESTABLISHING AND CONDUCTING SCIENCE AND ART SCHOOLS AND CLASSES. London, 1890.

ENDOWED SCHOOL ACTS, REPORTS FROM THE SELECT COMMITTEE ON. London, 1886–1887.

HAND AND EYE TRAINING. By George Ricks, B. Sc. 2 vols. Cassell & Co., London, 1890.

INDUSTRIAL EDUCATION ON THE CONTINENT. By Dr. Lyon Playfair. 1853.

LONDON COUNTY COUNCIL. Report to the special committee on technical education. By H. Llewellyn Smith, M. A. 1892.

MAKING OF THE HOME. By Mrs. Samuel A. Barnett. London.

A reading book of domestic economy for school and home use.

OFFICIAL HANDBOOK OF THE NATIONAL TRAINING SCHOOL FOR COOKERY. South Kensington, London.

SCIENTIFIC INSTRUCTION AND THE ADVANCEMENT OF SCIENCE, REPORTS OF THE ROYAL COMMISSION ON. London, 1872–1875.

STUDIES IN SECONDARY EDUCATION. Edited by A. H. D. Acland, M. P., and H. Llewellyn Smith, M. A., with an introduction by James Bryce, M. P. Percival & Co., London, 1892.

The contents of this work are divisible into three parts, viz., a historical survey, recent progress, and special district studies, as in London, Liverpool, Birmingham, etc.

SUMMER AT NÄÄS, A. By J. B. B. London, 1889.

TECHNICAL AND SECONDARY EDUCATION, RECORD OF.

A journal of the progress made by county councils and other local authorities in the administration of the technical instruction acts.

TECHNICAL EDUCATION. Proceedings of the international conference on education. London, 1884.

TECHNICAL EDUCATION AND FOREIGN COMPETITION. By Swire Smith. London, 1887.

TECHNICAL EDUCATION IN ENGLAND AND WALES. London, 1889.

TECHNICAL EDUCATION, PROSPECTUS OF THE NATIONAL ASSOCIATION FOR THE PROMOTION OF. London, 1890.

TECHNICAL EDUCATION: WHERE SHOULD IT BE GIVEN? By Silvanus P. Thompson. Bristol.

TECHNICAL INSTRUCTION ACT, 1889.

TECHNICAL INSTRUCTION, REPORTS OF THE ROYAL COMMISSIONERS ON. 5 vols. London, 1882–1884.

The status of industrial education in Austria, Belgium, France, Germany, Great Britain, Holland, Italy, Russia, Switzerland, and the United States at that remote epoch, a decade ago, is set forth with great minuteness and fidelity in these volumes. Their chief value at present is to show the low water mark of pedagogic interest in technical instruction at that date.

TECHNICAL TRAINING. By Thomas Twining. London, 1874.

WOOD WORK. By St. John. Wm. Blackwood & Sons, London and Edinburgh.

WOOD WORK (The English Sloid). By S. Barter, instructor of manual training in wood work to the London school board, etc. Whittaker & Co., London, 1892.

Contents: Drawing, timber (its various kinds, qualities, etc.), tools (how to adjust and use them), bench work, work room and its fittings, list of tools required, etc.

ITALY.

ANNALI DI STATISTICA, FASCICOLO XXX. 1891.

LAW CONCERNING SCHOOLS OF ARTS AND TRADES AND SPECIAL SCHOOLS FOR THE ADVANCEMENT OF INDUSTRIES AND COMMERCE, proposed by the minister of agriculture, industry, and commerce, December 2, 1889.

A very important bill for educational advancement in Italy. Its provisions are explained in the text of this report.

METHOD IN EDUCATION. By Rosmini. (In English.) Boston.

NOTIZIE SULL' ISTITUTO ALDINI-VALERIANI. Bologna, 1892.

REALE MUSEO INDUSTRIALE ITALIANO. By G. Jervis. Turin, 1869.

REALE SCUOLA D'ARTI E MESTIERI DI SPEZIA. 1887.

STATISTICA DELL' ISTRUZIONE SECONDARIA E SUPERIORE. 1887.

STATUTI ORGANICI DELLA PIA CASA DI LAVORO. Florence.

STATUTO ORGANICO DELLA SCUOLA PROFESSIONALE TIPOGRAFICA IN MILANO. 1888.

NORWAY.

HAANDARBEJDERN. By J. G. Smith. Christiania.

HANDARBEIT IN DER SCHULE. By W. Aubert. Christiania. 1874.

RUSSIA.

REVIEW OF THE PRESENT CONDITION OF MIDDLE AND LOWER TECHNICAL AND TRADE EDUCATION IN RUSSIA. By J. A. Anapoff, director of the Tsarevitch Trade School, etc. 1889.

STATISTISK ÅRSBOK FÖR FINLAND. For the years 1889–1892.

SWEDEN.

ÉCOLE PRATIQUE DE TRAVAIL POUR L'ENFANCE ET LA JEUNESSE À STOCKHOLM. By K. E. Palmgren.

SLÖJDSKOLAN OCH FOLKSKOLAN. Parts 1, 2, 3. By Otto Salomon. Gothenburg, 1880.

Also printed in German under the title *Handfertigkeitsschule und Volksschule.*

SUR L'IMPORTANCE DU TRAVAIL MANUEL DANS L'EDUCATION. By K. E. Palmgren. Stockholm.

This is a report of the conference of February 11, 1880.

SWITZERLAND.

ELEMENTAR UNTERRICHT IN DEN WEIBLICHEN HANDARBEITEN. By Susanna Müller. Zurich.

FORTBILDUNGSSCHULWESEN, DAS. By Dr. J. J. Kummer. Zurich, 1875.

FUNDAMENTAL IDEAS OF PESTALOZZI AND FROEBEL IN THEIR APPLICATION TO THE ELEMENTARY AND SECONDARY SCHOOL GRADES. Zurich, 1881.

HANDARBEIT IN DER SCHULE. By Koller. Zurich, 1881.

This book describes the system of instruction in vogue in the Swiss common and intermediate schools.

LEBENSFRAGE DER EUROPÄISCHEN ZIVILISATION UND DIE BEDEUTUNG DER FELLENBERGSCHEN BILDUNGSANSTALTEN ZU HOFWYL. By Scheidler. Jena, 1839.

LEONARD AND GERTRUDE. By Pestalozzi. (In English.) Boston.

MÉTHODE POUR ENSEIGNER LA GÉOGRAPHIE PAR L'OBSERVATION DES FORMES DE LA TERRE SUR LES LIEUX MÊMES ET LEUR REPRODUCTION EN RELIEF. By Beust. Zurich, 1875.

RELIEF MODELLING IN THE SCHOOL. (Also in German.) Zurich, 1881.

VOLKSWIRTHSCHAFTS-LEXIKON DER SCHWEIZ. By A. Furrer. Bern, 1885–1889.

INDEX.

A.

	Page.
Abbeville, Ala., Southeast Alabama Agricultural School	114
Aberdeen, Scotland, Robert Gordon's College	392
Act authorizing this investigation, construction of	15
Acts relating to technical instruction in Great Britain, consideration of	376, 377
Adler's, Dr. Felix, Workingman's School, New York, N. Y., manual training in	63, 64
Advanced primary schools in France, consideration of	233–243
Agricultural and horticultural schools in Belgium, consideration of	177–179
Agricultural and Mechanical College of Kentucky, Lexington	119
Agricultural and Mechanical College of Mississippi, Agricultural College P. O	121
Agricultural and Mechanical College of the University of the State of Missouri, Columbia	121, 122
Agricultural College and Training Farm, Tamworth, England	439
Agricultural College, Cirencester, England	438
Agricultural College, Downton, near Salisbury, England	438, 439
Agricultural College of New Mexico, Las Cruces	122, 123
Agricultural College of Utah Territory, Logan	128
Agricultural College P. O., Michigan Agricultural College	121
Agricultural College P. O., Miss., Agricultural and Mechanical College of Mississippi	121
Agricultural colleges, consideration of	112–131
Agricultural colleges in—	
Alabama	113, 114
Arizona	114
Arkansas	114, 115
California	115
Colorado	115, 116
Connecticut	116
Delaware	116
Florida	116, 117
Georgia	117, 118
Illinois	118
Indiana	118
Iowa	118, 119
Kansas	119
Kentucky	119
Louisiana	119
Maine	119, 120
Maryland	120
Massachusetts	120, 121
Michigan	121
Minnesota	121
Mississippi	121
Missouri	121, 122
Nebraska	122
Nevada	122
New Hampshire	122
New Jersey	122
New Mexico	122, 123
New York	123
North Carolina	123
North Dakota	123
Ohio	123
Oregon	123
Pennsylvania	123, 124
Rhode Island	124–127
South Carolina	127, 128
South Dakota	128
Tennessee	128
Texas	128
Utah	128
Vermont	128, 129
Virginia	129
West Virginia	129
Wisconsin	129
Agricultural colleges, manual labor in	130
Agricultural colleges, United States:	
Abbeville, Ala., Southeast Alabama Agricultural School	114
Agricultural and Mechanical College, Agricultural College P. O., Miss	121
Agricultural and Mechanical College of Kentucky, Lexington	119

Page.

Agricultural colleges, United States—Continued.
Agricultural and Mechanical School, Columbia, Mo. 121, 122
Agricultural College of New Mexico, Las Cruces 122, 123
Agricultural College of Utah Territory, Logan 128
Agricultural College P. O., Michigan Agricultural College 121
Agricultural College P. O., Miss., Agricultural and Mechanical College 121
Alabama Polytechnic Institute, Auburn, Ala 113
Alcorn Agricultural and Mechanical College, Rodney, Miss 121
Ames, Iowa, State College of Agriculture and Mechanic Arts 118, 119
Amherst, Mass., Agricultural College 120
Arkansas Industrial University, Fayetteville, Ark 114, 115
Athens, Ala., North Alabama Agricultural School 114
Athens, Ga., State College of Agriculture and Mechanic Arts 117
Auburn, Ala., Polytechnic Institute 113
Baton Rouge, La., State University and Agricultural and Mechanical College 119
Berkeley, Cal., College of Agriculture 115
Blacksburgh, Va., Agricultural and Mechanical College 129
Brookings, S. Dak., Agricultural College 128
Brown University, Providence, R. I., agricultural education in 124
Burlington, Vt., State Agricultural College 128, 129
Bussey Institution of Harvard University, Jamaica Plain, Mass 120, 121
College of Agriculture and Mechanic Arts, Columbia, S. C 127
College of Agriculture and Mechanics' Institute, Orangeburgh, S. C 127, 128
College of Agriculture, Berkeley, Cal 115
College of Agriculture, Madison, Wis 129
College of Agriculture of Cornell University, Ithaca, N. Y 123
College of Agriculture, Saint Anthony Park, Minn 121
College Station, Tex., State Agricultural and Mechanical College 128
Columbia, Mo., Agricultural and Mechanical School 121, 122
Columbia, S. C., College of Agriculture and Mechanic Arts 127
Columbus, Ohio, State University, agricultural education in 123
Corvallis, Oreg., State Agricultural College 123
Cuthbert, Ga., Southwest Georgia Agricultural College 118
Dahlonega, Ga., North Georgia Agricultural College 118
Delaware College, Newark, Del., agricultural education in 116
Fargo, N. Dak., Agricultural College 123
Fayetteville, Ark., Industrial University 114, 115
Florida State Agricultural and Mechanical College, Lake City, Fla 116, 117
Fort Collins, Colo., State Agricultural College 115, 116
Georgia State College of Agriculture and Mechanic Arts, Athens, Ga 117
Hamilton, Ga., West Georgia Agricultural and Mechanical College 118
Hampton Normal and Agricultural Institute, Hampton, Va 129
Hanover, N. H., State College of Agriculture and the Mechanic Arts 122
Huntsville, Ala., State Colored Normal and Industrial School, agricultural education in 113, 114
Industrial College, Lincoln, Nebr., agricultural education in 122
Industrial University, Fayetteville, Ark 114, 115
Iowa State College of Agriculture and Mechanic Arts, Ames, Iowa 118, 119
Ithaca, N. Y., College of Agriculture of Cornell University 123
Jamaica Plain, Mass., Bussey Institution of Harvard University 120, 121
Kansas State Agricultural College, Manhattan, Kans 119
Kingston, R. I., College of Agriculture and Mechanic Arts 124–127
Knoxville, Tenn., State Agricultural and Mechanical College 128
La Fayette, Ind., School of Agriculture of Purdue University 118
Lake City, Fla., State Agricultural and Mechanical College 116, 117
Las Cruces, N. Mex., Agricultural College of New Mexico 122, 123
Lexington, Ky., Agricultural and Mechanical College 119
Lincoln, Nebr., Industrial College, agricultural education in 122
Logan, Utah, Agricultural College of Utah Territory 128
Louisiana State University and Agricultural and Mechanical College, Baton Rouge, La. 119
Madison, Wis., College of Agriculture 129
Maine State College of Agriculture and the Mechanic Arts, Orono, Me 119, 120
Manhattan, Kans., State Agricultural College 119
Mansfield, Conn., Storrs Agricultural School 116
Maryland Agricultural College 120
Massachusetts Agricultural College, Amherst, Mass 120
Michigan Agricultural College, Agricultural College P. O., Mich 121
Middle Georgia Military and Agricultural College, Milledgeville, Ga 117, 118
Milledgeville, Ga., Middle Georgia Military and Agricultural College 117, 118
Morgantown, W. Va., West Virginia University, agricultural education in 129
Newark, Del., Delaware College, agricultural education in 116
New Brunswick, N. J., Rutgers Scientific School, agricultural education in 122
New Haven, Conn., Sheffield Scientific School, agricultural education in 116
Normal and Agricultural Institute, Hampton, Va 129
Normal and Industrial School (Colored), Huntsville, Ala., agricultural education in 113, 114
North Alabama Agricultural School, Athens, Ala 114
North Carolina College of Agriculture and Mechanic Arts, Raleigh, N. C 123
North Dakota Agricultural College, Fargo, N. Dak 123
North Georgia Agricultural College, Dahlonega, Ga 118
Ohio State University, Columbus, Ohio, agricultural education in 123
Orangeburgh, S. C., College of Agriculture and Mechanics' Institute 127, 128
Oregon State Agricultural College, Corvallis, Oreg 123
Orono, Me., State College of Agriculture and the Mechanic Arts 119, 120
Pennsylvania State College, State College P. O., Pa., agricultural education in 123, 124
Polytechnic Institute, Auburn, Ala 113
Providence, R. I., Brown University, agricultural education in 124
Raleigh, N. C., College of Agriculture and Mechanic Arts 123
Reno, Nev., School of Agriculture 122

Page.

Agricultural colleges, United States—Concluded.
Rhode Island College of Agriculture and Mechanic Arts, Kingston, R. I. 124-127
Rodney, Miss., Alcorn Agricultural and Mechanical College 121
Rutgers Scientific School, New Brunswick, N. J., agricultural education in 122
Saint Anthony Park, Minn., College of Agriculture 121
Saint Anthony Park, Minn., State School of Agriculture 121
School of Agriculture of Purdue University, La Fayette, Ind 118
School of Agriculture, Reno, Nev 122
Sheffield Scientific School of Yale University, New Haven, Conn., agricultural education in 116
South Dakota Agricultural College, Brookings, S. Dak 128
South Georgia Agricultural College, Thomasville, Ga 118
Southeast Alabama Agricultural School, Abbeville, Ala 114
Southwest Georgia Agricultural College, Cuthbert, Ga 118
State Agricultural and Mechanical College, College Station, Tex 128
State Agricultural and Mechanical College, Knoxville, Tenn 128
State Agricultural and Mechanical College, Lake City, Fla 116, 117
State Agricultural College, Burlington, Vt 128, 129
State Agricultural College, Corvallis, Oreg 123
State Agricultural College, Manhattan, Kans 119
State Agricultural College of Colorado, Fort Collins 115, 116
State College of Agriculture and Mechanic Arts, Ames, Iowa 118, 119
State College of Agriculture and Mechanic Arts, Athens, Ga 117
State College of Agriculture and the Mechanic Arts, Hanover, N. H 122
State College of Agriculture and the Mechanic Arts, Orono, Me 119, 120
State College, State College P. O., Pa 123, 124
State Colored Normal and Industrial School, Huntsville, Ala., agricultural education in 113, 114
State School of Agriculture, Saint Anthony Park, Minn 121
State University and Agricultural and Mechanical College, Baton Rouge, La 119
State University, Columbus, Ohio, agricultural education in 123
Storrs Agricultural School, Mansfield, Conn 116
Thomasville, Ga., South Georgia Agricultural College 118
Tucson, Ariz., agricultural university 114
University of Illinois, Urbana, agricultural education in 118
Urbana, Ill., University of Illinois, agricultural education in 118
Virginia Agricultural and Mechanical College, Blacksburgh, Va 129
West Georgia Agricultural and Mechanical College, Hamilton, Ga 118
West Virginia University, Morgantown, W. Va., agricultural education in 129
Agricultural education, legislation for 130, 131
Agricultural experiment stations 130
Agriculture, schools of, in Great Britain, consideration of 437-440
Aiken, S. C., manual training in 70
Aix, Châlons, and Angers, France, National Schools of Arts and Trades at 286-290
Alabama, agricultural colleges in, consideration of 113, 114
Alabama, manual training schools in, consideration of 26-28
Alabama Polytechnic Institute, Auburn, Ala., an agricultural college 113
Alais and Douai, France, schools for master miners 294, 295
Albany High School, Albany, N. Y., a manual training school 57, 58
Albemarle, Miller Manual Labor School of, Crozet, Va 71-76
Alcorn Agricultural and Mechanical College, Rodney, Miss 121
Aldini-Valeriani Institute, Bologna, Italy 451, 452
Alsace-Lorraine, Industrial Society of Mülhausen 371
American manual training schools generally superior to European ones 18, 19
American technical and trade schools generally inferior to European ones 18, 19
Ames, Iowa, State College of Agriculture and Mechanic Arts 118, 119
Amherst, Mass., Agricultural College 129
Angers, Châlons, and Aix, France, National Schools of Arts and Trades at 286-290
Ann Arbor, Mich., University of Michigan, technical education in 139
Antwerp, Belgium, Industrial School 200, 201
Antwerp, Belgium, Trade School for Girls (intermediate) 187
Applied Mechanics, Watchmaking, and Electricity, National School of, Brussels, Belgium 196, 197
Apprentices, Diderot School for, Paris, France 247, 248
Apprentices, School of, of the Industrial Society of Nantes, France 284
Apprentices to tailoring trade, school for, Paris, France 280, 281
Apprenticeship in France, consideration of 275, 276
Apprenticeship (Manual), National School of, Armentières, France 262-265
Apprenticeship (Manual) School, Boulogne-sur-Mer, France 260
Apprenticeship (Manual) School for Boys, Reims, France 257-259
Apprenticeship (Manual) School for Boys, Saint-Etienne, France 255-257
Apprenticeship (Manual) School for the Book Publishing Industry, Paris, France 249-251
Apprenticeship (Manual) School, Nantes, France 259
Apprenticeship (Manual) School of Furniture Making, Paris, France 251, 252
Apprenticeship (Manual) School, Rouen, France 260
Apprenticeship (Manual) School, Saint-Chamond, France 259
Apprenticeship (manual) schools in France, consideration of 243-260
Apprenticeship (manual) schools, Paris, France 246, 247
Apprenticeship of Boys, Municipal School for the, Havre, France 253-255
Apprenticeship schools in Belgium, consideration of 176, 177
Arizona, agricultural colleges in, consideration of 114
Arkansas, agricultural colleges in, consideration of 114, 115
Arkansas Industrial University, Fayetteville, Ark., an agricultural college 114, 115
Armentières, France, National School of Manual Apprenticeship 262-265
Armour Institute, Chicago, Ill., consideration of 98, 99
Art Academy, Cincinnati, Ohio, consideration of 110
Art Academy, Dresden, Saxony 355, 356
Art Academy, Leipsic, Saxony 358, 359

Page.
Art and Needlework, School of, Zurich, Switzerland 560-562
Art School, Birmingham, England 394
Art School (Industrial), Dresden, Saxony 356, 357
Art School (Industrial), Zurich, Switzerland 569, 570
Art School (Municipal), Geneva, Switzerland 568
Art schools (industrial) in Switzerland 568-571
Artist-Artisans, Institute for, New York, N. Y., consideration of 107-109
Arts and Manufactures, Central School of, Paris, France 295, 296
Arts and Trades, National Conservatory of, Paris, France 296, 297
Arts and Trades, National Schools of, Châlons, Angers, and Aix, France 288-290
Athens, Ala., North Alabama Agricultural School 114
Athens, Ga., manual training in 30-31
Athens, Ga., State College of Agriculture and Mechanic Arts 117
Atlanta, Ga., manual training for colored students in 31
Atlanta University, Atlanta, Ga., a manual training school 29
Auburn, Ala., Polytechnic Institute, an agricultural college 113
Aubusson, France, School of Tapestry 298
Austria—
continuation and trade schools in, consideration of 148-160
manual training in, consideration of 143-148
manual training schools for teachers in 144, 145
present status of industrial education in 141-160
Aversa, Italy, Scuola d'Arti e Mestieri nell' Istituto Artistico di San Lorenzo 454, 455

B.

Baltimore, Md., manual training in 37, 38
Baltimore School of Manual Training, Baltimore, Md 37, 38
Basel, Switzerland, Trade School for Women 552-557
Baton Rouge, La., State University and Agricultural and Mechanical College 119
Battersea Institute, London, England 410
Bavaria, industrial trade schools and continuation schools in 362-366
Beardstown, Ill., manual training in 32
Beaumont Institute, or the People's Palace, London, England 407, 408
Belfast, Ireland, Technical School 431
Belfast Technical School, Belfast, Ireland 431
Belgium—
apprenticeship schools in, consideration of 176, 177
commercial institutes in, consideration of 214-216
drawing schools in, consideration of 212-214
housekeeping schools for girls in, consideration of 179-182
industrial and technical schools in, consideration of 170-176
industrial schools in, consideration of 198-211
kindergartens in, consideration of 163, 164
manual training for boys in the public schools in, consideration of 168-170
manual training for girls in the public schools in, consideration of 164-168
parochial trade schools in, consideration of 188, 189
present status of industrial education in 161-216
public school system in, consideration of 162-170
schools of agriculture and horticulture in, consideration of 177-179
schools of industry and mines in, consideration of 216
trade schools for girls in, consideration of 182-188
trade schools founded by guilds and trades in, consideration of 189-193
trade schools in, consideration of 193-198
Berkeley, Cal., College of Agriculture of the University of California 115
Berlin, Prussia, various trade schools in 341-345
Bern, Switzerland, School for Carpenters and Shoemakers 533-537
Bern, Switzerland, School for Servants 557-560
Bern, Switzerland, Trade School for Women 549-553
Bern, Switzerland, Workingmen's School 574
Bernard Palissy School, Paris, France 301, 302
Bibliography 683-686
Bienne, Switzerland, School of Watchmaking 525, 526
Birkbeck Literary and Scientific Institution, London, England 410, 411
Birmingham, England, Mason Science College 421, 422
Birmingham, England, School of Art 394
Birmingham, England, technical schools 392-394
Bishop College, Marshall, Tex., manual training in 71
Blacksburgh, Va., Agricultural and Mechanical College 129
Blankenberghe, Belgium, School for Fishermen 198
Bologna, Italy, Aldini-Valeriani Institute 451, 452
Bologna, Italy, technical instruction at 445
Book Publishing Industry, Manual Apprenticeship School for the, Paris, France 249-251
Book work in conjunction with manual training 599-620
Book work in relation to manual training in France, consideration of 260
Boston, Mass., first general conference on manual training held in, April 8-11, 1891 77-79
Boston, Mass., Lowell School of Practical Design, consideration of 111, 112
Boston, Mass., manual training schools 40-44
Boston, Mass., Massachusetts Institute of Technology 132-134
Boulogne-sur-Mer, France, Manual Apprenticeship School 260
Bradford, England, Technical College 414-418
Bradford Technical College, Bradford, England 414-418
Bremen, Germany, industrial trade schools in 362
Brewing School, Ghent, Belgium 192, 193
Bridges and Highways, National School of, Paris, France 292, 293
Brienz, Switzerland, School for Wood Carving 540, 541
Bristol, England, Merchant Venturers' School 481
Brookings, S. Dak., Agricultural College 128

Page.
Brookline, Mass., Manual Training School 44, 45
Brooklyn, N. Y., Pratt Institute, a manual training school 58
Brooklyn, N. Y., Pratt Institute, as an industrial school 87-94
Brown University, Providence, R. I., agricultural education in 124
Bruck, Austria, Royal School of the Wood Working Industry 149, 150
Brussels, Belgium—
Housekeeping School, rue Locquenghien 180, 181
Industrial School 201
National School of Watchmaking, Electricity, and Applied Mechanics 196, 197
School for Tailors 190, 191
School of Typography 191, 192
Trade School for Girls, rue des Terres Neuves 186
Trade School for Girls, rue du Marais 182-185
Trade School for Girls, rue du Poinçon 185, 186
Buchs, Switzerland, Housekeeping School 564-566
Budapesth, Hungary, manual training in 146, 147
Builders' Exchange school, Philadelphia, Pa., consideration of 83, 84
Building School, Royal, at Gotha, Saxe-Coburg-Gotha 360, 361
Building Trade School at Nuremberg, Bavaria 364, 365
Burlington, Vt., State Agricultural College of the University of Vermont 128, 129
Bussey Institution of Harvard University, Jamaica Plain, Mass., an agricultural college 120, 121

C.

California, agricultural colleges in, consideration of 115
California, manual training schools in, consideration of 28
Cambridge, Mass., Manual Training School 45-47
Cantonal School of Industrial Arts, Geneva, Switzerland 568, 569
Carpenters and Shoemakers, School for, Bern, Switzerland 533-537
Case School of Applied Science, Cleveland, Ohio 138, 139
Central Industrial School, Lyons, France 290
Central Institute, London, England 386, 387
Central School of Arts and Manufactures, Paris, France 295, 296
Central Tennessee College, Nashville, manual training in (colored) 71
Ceramics, School of, Limoges, France 298, 299
Chaix Printing Company, Trade School of the, Paris, France 278, 279
Châlons, Angers, and Aix, France, National Schools of Arts and Trades at 286-290
Charleroi, Belgium, Industrial School 201-203
Chaux-de-Fonds, Switzerland, School of Watchmaking and Mechanics 516-520
Chelsea Institute, London, England 413
Chemistry and Physics (Industrial), School of, Paris, France 248, 249
Chemistry (Industrial), School of, Lyons, France 285, 286
Chemnitz, Saxony, industrial trade schools in 357, 358
Chicago, Ill., Armour Institute, consideration of 98, 99
Chicago Manual Training School, Chicago, Ill 32, 33
Chieti, Italy, Scuola d'Arti Applicata all' Industria 454
Church schools for industrial education in France 286
Cincinnati, Ohio, Art Academy, consideration of 110
Cincinnati, Ohio, Mechanics' Institute, consideration of 110
Cincinnati, Ohio, Technical School, a manual training school 64, 65
Cincinnati, Ohio, University of Cincinnati, technical education in 136
Cirencester, England, Royal Agricultural College 438
City of London College, London, England 412, 413
City Trade School, Leipsic, Saxony 359, 360
Clark University, Atlanta, Ga., a manual training school 31
Classification of industrial schools in Switzerland, consideration of 506
Clerkenwell Polytechnic Institute, London, England 413
Cleveland, Ohio, Case School of Applied Science 138, 139
Cleveland, Ohio, Manual Training School 65, 66
Cluny, France, National School for Training Foremen and Skilled Mechanics 291
Cluses, France, National School for Watchmaking 265-267
Cogswell Polytechnic College, San Francisco, Cal., a manual training school 28
College for Men and Women, London, England 411, 412
College for Working Women, London, England 412
College of Agriculture and Mechanic Arts of the University of South Carolina, Columbia 127
College of Agriculture and Mechanics' Institute of Claflin University, Orangeburgh, S. C 127, 128
College of Agriculture of Cornell University, Ithaca, N. Y 123
College of Agriculture of the University of California, Berkeley 115
College of Agriculture of the University of Minnesota, Saint Anthony Park 121
College of Agriculture of the University of Wisconsin, Madison 129
College of the City of New York, N. Y., manual training in 61, 62
College Station, Tex., State Agricultural and Mechanical College of Texas 128
Cologne, Prussia, industrial educational establishment 347-349
Colorado, agricultural colleges in, consideration of 115, 116
Columbia, Mo., Agricultural and Mechanical School of the University of the State of Missouri 121, 122
Columbia, S. C., College of Agriculture and Mechanic Arts of the University of South Carolina 127
Columbia, S. C., manual training in 70
Columbus, Ohio, State University, agricultural education in 123
Commerce and Weaving, Advanced School of, Lyons, France 285
Commercial institutes in Belgium, consideration of 214-216
Concord, N. H., manual training in 54
Conference on manual training 77-79
Connecticut, agricultural colleges in, consideration of 116
Connecticut, manual training schools in, consideration of 28, 29
Conservatory (National) of Arts and Trades, Paris, France 296, 297
Continuation and trade schools in Austria, consideration of 148-160
Continuation schools and industrial trade schools in Bavaria 362-366

Page.
Continuation schools and industrial trade schools in Prussia, consideration of 336-350
Continuation schools and industrial trade schools in Saxony, Hamburg, and Bremen, consideration of 350-362
Continuation schools and industrial trade schools in Würtemberg, consideration of 366-370
Cooking and sewing, training in the public schools of Philadelphia, Pa., in 660-662
Corvallis, Oreg., State Agricultural College 125
Coventry, England, Technical Institute 431, 432
Coventry Technical Institute, Coventry, England 431, 432
Crefeld, Prussia, School of Weaving, Dyeing, and Finishing 338-341
Crozet, Va., manual training in 71-76
Cuthbert, Ga., Southwest Georgia Agricultural College 118
Cygnaeus, Uno, of Helsingfors, the originator of manual training 16

D.

Dahlonega, Ga., North Georgia Agricultural College 118
Dairy schools in Great Britain 439, 440
Decorative Arts, National School of, Paris, France 297, 298
Definition of the terms manual training school, trade school, technical school, and institute of technology 15, 16
Delaware, agricultural colleges in, consideration of 116
Delaware College, Newark, agricultural education in 116
Denmark, manual training in, consideration of 492-498
Denmark, Norway, and Sweden. *See* Scandinavian countries.
Design, National School of, for Girls, Paris, France 298
Designing Academy at Hanau, Prussia 350
Diderot School for Apprentices, Paris, France 247, 248
District of Columbia, public schools of the 593-598
Douai and Alais, France, schools for master miners 294, 295
Downton College of Agriculture, near Salisbury, England 438, 439
Drawing in the public schools of Paris, France 301
Drawing School for Trades and Industries, Saint Gall, Switzerland 570, 571
Drawing schools in Belgium, consideration of 212-214
Drawing schools, municipal, in France 300
Dresden, Saxony, Royal Academy of Arts 355, 356
Dresden, Saxony, Royal School of Industrial Art 356, 357
Drexel Institute, Philadelphia, Pa., consideration of 94-98
Duluth, Minn., manual training in 49
Dundee, Scotland, Technical Institute 429, 430
Durfee, B. M. C., High School, Fall River, Mass., manual training in 47
Durham College of Science, Newcastle, England 424, 425
Dusseldorf, Prussia, School of Industrial Art 349
Dyeing, Finishing, and Weaving School, Crefeld, Prussia 338-341

E.

Eastern Railway Company School, Paris, France 279, 280
Easton, Pa., Lafayette College, technical education in 135, 136
École de Typographie, Brussels, Belgium 191, 192
Edinburgh, Scotland, Heriot-Watt College 426-429
Education, legislation for agricultural 130, 131
Education, need of technical 102-105
Education of a purely industrial character in France, consideration of 260-262
Education of working people in Switzerland, institutions for the, consideration of 571-577
Effect of manual training and trade instruction upon the individual 651-662
Electricity, Watchmaking, and Applied Mechanics, National School of, Brussels, Belgium 196, 197
Elementary manual instruction in Great Britain, consideration of 384-386
Elementary primary schools in France, consideration of 221-233
Elephant and Castle Institute, London, England 410
Elmira, N. Y., manual training and trade instruction in the reformatory at 621-650
Emerson Institute, Mobile, Ala., a manual training school (colored) 26, 27
Employers' opinions on technical education in Great Britain 434-437
English High and Manual Training School, Chicago, Ill 34
Essen, Prussia, Krupp schools 349, 350
European manual training schools generally inferior to American ones 18, 19
European technical and trade schools generally superior to American ones 18, 19
Experiment stations, agricultural 130

F.

Fabriano, Italy, Scuola Professionale 451
Fachschule für das Maschinengewerbe, Klagenfurth, Austria 152
Fachschule für Holzindustrie, Bruck, Austria 149, 150
Fachschule für Holzindustrie, Hall, Austria 151, 152
Fachschule für Holzindustrie, Villach, Austria 156-158
Fall River, Mass., manual training in 47
Fargo, N. Dak., Agricultural College 123
Fayetteville, Ark., Industrial University, an agricultural college 114, 115
Finishing, Dyeing, and Weaving School, Crefeld, Prussia 338-341
Finland, Russia, industrial education in, consideration of 464-469
Finsbury Technical College, London, England 387, 388
Fishermen, School for, Blankenberghe, Belgium 198
Fishermen, School for, Ostend, Belgium 197, 198
Fisk University, Nashville, Tenn., manual training in (colored) 71
Fleurier, Switzerland, School of Watchmaking 522, 523
Florence, Italy, Pia Casa di Lavoro 447
Florida, agricultural colleges in, consideration of 116, 117

Page.
Florida, manual training schools in, consideration of 29
Florida State Agricultural and Mechanical College, Lake City, Fla 116, 117
Foggia, Italy, Scuola Professionale 455
Foligno, Italy, School of Arts and Trades 448, 449
Fortbildungsschulen (continuation schools) in Austria, consideration of 148-160
Fort Collins, Colo., State Agricultural College 115, 116
France—
advanced primary schools in, consideration of 233-243
apprenticeship in, consideration of 275, 276
book work in relation to manual training in, consideration of 260
church schools for industrial education in 286
education of a purely industrial character in, consideration of 260-262
elementary primary schools in, consideration of 221-233
industrial art education in, consideration of 297-302
industrial schools for national manufactories 295
infant schools in, consideration of 220, 221
manual apprenticeship schools in, consideration of 243-260
manual training called manual labor in 17
municipal drawing schools in 300
present status of industrial education in 217-302
primary industrial schools in, consideration of 262-286
public school system in, consideration of 219-260
secondary industrial schools in 286-291
superior industrial schools in, consideration of 291-297
travelling scholarships to graduates of industrial schools in, consideration of 302
Frankfort on the Main, Prussia, Industrial Continuation School 346, 347
Frankfort on the Main, Prussia, School of Industrial Art 345, 346
Free School of Mechanical Trades, Williamson School P. O., Pa., consideration of 85-87
Furniture Making, Manual Apprenticeship School of, Paris, France 251, 252

G.

General Society of Mechanics and Tradesmen, New York, N. Y., consideration of 100, 101
Geneva, Switzerland—
Cantonal School of Industrial Arts 568, 569
kindergartens and manual training at 509-513
Municipal School of Art 568
Professional Academy 576, 577
School of Watchmaking and Mechanics 530-533
Genoa, Italy, manual training at 444
Georgia, agricultural colleges in, consideration of 117, 118
Georgia, manual training schools in, consideration of 29-32
Georgia School of Technology, the manual training branch of the University of Georgia 30, 31
Georgia State College of Agriculture and Mechanic Arts, Athens, Ga 117
Germain Pilon School, Paris, France 301
Germany—
higher institutions for industrial education in, consideration of 328-336
manual training called manual dexterity or workshop instruction in 17
manual training in, consideration of 305-328
present status of industrial education in 303-371
Gewerbeschulen (trade schools) in Austria, consideration of 148-160
Ghent, Belgium—
Brewing School 192, 193
Industrial School 203-205
Trade School 195, 196
Trade School for Girls 187
Girard College, Philadelphia, Pa., manual training in 67, 68
Girgenti, Italy, Scuola d'Arti e Mestieri Gioeni 454
Glasgow, Scotland, weaving school 430, 431
Glasgow weaving school, Glasgow, Scotland 430, 431
Goldsmiths' Company Institute, London, England 409, 410
Gotha, Saxe-Coburg-Gotha, Royal Building School 360, 361
Grammar and high schools in the United States, manual training in 608-617
Grätz, Austria, State Industrial School 150, 151
Great Britain—
acts relating to technical instruction in, consideration of 376, 377
beginning of the movement for industrial education in, consideration of 375
dairy schools in 439, 440
elementary manual instruction in, consideration of 384-386
means of support of industrial education in, consideration of 377-384
National Association for the Promotion of Technical Education in, consideration of 384
opinions of English employers on technical education in 434-437
present status of industrial education in 373-440
results of technical education in, consideration of 434-437
schools of agriculture in, consideration of 437-440
secondary and higher institutions for industrial education in, consideration of 386-396
technical instruction in country districts in 432-434
technical schools in, consideration of 396-434
Gutenberg Typographical School, Paris, France 277, 278

H.

Hall, Austria, school of the wood working industry 151, 152
Hamburg, Germany, industrial trade schools in 361, 362
Hamilton, Ga., West Georgia Agricultural and Mechanical College 118
Hampton Normal and Agricultural Institute, Hampton, Va 129
Hanau, Prussia, Royal Designing Academy 350

Page.
Handicraft and Industrial School, Saint Petersburg, Russia 462
Hanover, N. H., State College of Agriculture and the Mechanic Arts 122
Hartshorn Memorial College, Richmond, Va., manual training in 76
Havre, France, Municipal School for the Apprenticeship of Boys 253-255
Hebrew Technical Institute of New York, N. Y., a manual training school 62, 63
Heriot-Watt College, Edinburgh, Scotland 426-429
High and grammar schools in the United States, manual training in 608-617
Higher institutions for industrial education in Germany, consideration of 328-336
Hoboken, N. J., manual training in 55, 56
Hoboken, N. J., Stevens Institute of Technology 133
Hoe & Co.'s School, New York, N. Y., consideration of 101, 102
Horticultural and agricultural schools in Belgium, consideration of 177-179
Horwich, England, Lancashire and Yorkshire Railway Company's School 432
Houghton, Mich., Mining School, consideration of 112
Housekeeping and industrial schools for girls, Paris, France 252, 253
Housekeeping School, Buchs, Switzerland 564-566
Housekeeping School, Louvain, Belgium 181, 182
Housekeeping School, Morlanwelz, Belgium 181
Housekeeping School, rue Locquenghien, Brussels, Belgium 180, 181
Housekeeping School, Worb, Switzerland 566-568
Housekeeping schools for girls in Belgium, consideration of 179-182
Huddersfield, England, Technical School 414
Huddersfield Technical School, Huddersfield, England 414
Huntsville, Ala., State Colored Normal and Industrial School, agricultural education in 113, 114

I.

Illinois, agricultural colleges in, consideration of 118
Illinois, manual training schools in, consideration of 32-35
Indiana, agricultural colleges in, consideration of 118
Indiana, manual training schools in, consideration of 35
Indianapolis, Ind., manual training in 35
Industrial and Drawing School, Soignies, Belgium 210, 211
Industrial and Handicraft School, Saint Petersburg, Russia 462
Industrial and housekeeping schools for girls, Paris, France 252, 253
Industrial and technical schools in Belgium, consideration of 170-176
Industrial Art and Technical Design, School of, for Women, New York, N. Y., consideration of 109, 110
Industrial art education in France, consideration of 297-302
Industrial Art, School of, Dresden, Saxony 356, 357
Industrial Art, School of, Dusseldorf, Prussia 349
Industrial Art, School of, Frankfort on the Main, Prussia 345, 346
Industrial Art School, Zurich, Switzerland 569, 570
Industrial art schools in Switzerland 568-571
Industrial Arts, Cantonal School of, Geneva, Switzerland 568, 569
Industrial Arts, National School of, Roubaix, France 299
Industrial Arts, School of, Reims, France 300
Industrial Arts, School of, Saint-Etienne, France 299, 300
Industrial Chemistry, School of, Lyons, France 285, 286
Industrial College of the University of Nebraska, Lincoln, agricultural education in 122
Industrial Continuation School, Frankfort on the Main, Prussia 346, 347
Industrial educational establishment at Cologne, Prussia 347-349
Industrial Education Association of New York, N. Y., manual training in 62
Industrial education in—
- Austria, present status of 141-160
- Belgium, present status of 161-216
- Finland, Russia, consideration of 464-469
- France, present status of 217-300
- Germany, higher institutions for, consideration of 328-336
- Germany, present status of 303-371
- Great Britain, beginning of the movement for, consideration of 375
- Great Britain, present status of 373-440
- Great Britain, secondary and higher institutions for, consideration of 386-398
- Italy, present status of 441-457
- Prague, Austria 159, 160
- Russia, present status of 459-463
- Scandinavian countries, present status of 485-498
- Switzerland, national subsidies for, consideration of 501-505
- Switzerland, present status of 499-566
- United States, present status of 21-139

Industrial education, means of support in Great Britain of, consideration of 377-384
Industrial Education of Women, schools of the Society for, Paris, France 281, 282
Industrial Institute of the North of France, Lille, France 299, 291
Industrial Physics and Chemistry, School of, Paris, France 248, 249
Industrial School at—
- Antwerp, Belgium 200, 201
- Brussels, Belgium 201
- Charleroi, Belgium 201-203
- Ghent, Belgium 203-205
- Grätz, Austria 150, 151
- Innsbruck, Austria 151, 152
- Jemmapes, Belgium 206
- La Louvière, Belgium 205, 206
- Liege, Belgium 206, 207
- Louvain, Belgium 207, 208
- Lyons, France (Central) 290
- Marchiennes au Pont, Belgium 208
- Morlanwelz, Belgium 208, 209

Page.

Industrial School at—Concluded.
Ostend, Belgium 209
Riesbach, Switzerland 572, 573
Salzburg, Austria 152, 153
Seraing, Belgium 209, 210
Stockport, England 391, 392
Tournay, Belgium 194, 195
Triest, Austria 153, 154
Verviers, Belgium 211
Zurich, Switzerland 574, 575
Industrial schools for national manufactories, France 295
Industrial schools in Belgium, consideration of 198-211
Industrial schools in France, travelling scholarships to graduates of, consideration of 302
Industrial schools in Russia, official regulations for 479-483
Industrial schools in Switzerland, classification of, consideration of 506
Industrial schools (primary) in France, consideration of 262-286
Industrial schools (secondary) in France, consideration of 286-291
Industrial schools (superior) in France, consideration of 291-297
Industrial Society of Mülhausen, Alsace-Lorraine 371
Industrial Society, School of Apprentices of, Nantes, France 284
Industrial Society, Trade School of, Saint-Quentin, France 283, 284
Industrial trade schools and continuation schools in Bavaria 362-366
Industrial trade schools and continuation schools in Prussia, consideration of 336-350
Industrial trade schools and continuation schools in Saxony, Hamburg, and Bremen, consideration of 350-362
Industrial trade schools and continuation schools in Würtemberg, consideration of 366-370
Industrial trade schools in Chemnitz, Saxony 357, 358
Industrial University, Fayetteville, Ark., an agricultural college 114, 115
Industry and mines, schools of, in Belgium, consideration of 216
Infant schools in France, consideraton of 220, 221
Innsbruck, Austria, State Industrial School 151, 152
Institute for Artist-Artisans, New York, N. Y., consideration of 107-109
Institute for Colored Youth, Philadelphia, Pa., consideration of 84, 85
Institute of technology, definition of term 16
Institute Turgot (advanced primary school for boys), manual training in, Roubaix, France 238-241
Institutes of technology, consideration of 132-139
Institutes of technology, United States:
Ann Arbor, Mich., University of Michigan, technical education in 139
Boston, Mass., Massachusetts Institute of Technology 132-134
Case School of Applied Science, Cleveland, Ohio 138, 139
Cincinnati, Ohio, University of Cincinnati, technical education in 136
Cleveland, Ohio, Case School of Applied Science 138, 139
Easton, Pa., Lafayette College, technical education in 135, 136
Hoboken, N. J., Stevens Institute of Technology 138
Lafayette College, Easton, Pa., technical education in 135, 136
Lawrence Scientific School, Cambridge, Mass 135
Leland Stanford Junior University, Palo Alto, Cal., technical education in 136
Massachusetts Institute of Technology, Boston, Mass 132-134
Missouri School of Mines and Metallurgy, Rolla, Mo 139
Nashville, Tenn., Vanderbilt University, technical education in 134, 135
Palo Alto, Cal., Leland Stanford Junior University, technical education in 136
Rensselaer Polytechnic Institute, Troy, N. Y 132
Rolla, Mo., Missouri School of Mines and Metallurgy 139
Rose Polytechnic Institute, Terre Haute, Ind 137, 138
Stevens Institute of Technology, Hoboken, N. J 138
Terre Haute, Ind., Rose Polytechnic Institute 137, 138
Troy, N. Y., Rensselaer Polytechnic Institute 132
University of Cincinnati, Cincinnati, Ohio, technical education in 136
University of Michigan, Ann Arbor, technical education in 139
Vanderbilt University, Nashville, Tenn., technical education in 134, 135
Worcester, Mass., Worcester Polytechnic Institute 136, 137
Worcester Polytechnic Institute, Worcester, Mass 136, 137
Institution Livet, Nantes, France 272-275
Institutions for the education of working people in Switzerland, consideration of 571-577
Institutions (higher) for industrial education in Germany, consideration of 328-336
Introduction 13-19
Iowa, agricultural colleges in, consideration of 118, 119
Iowa State College of Agriculture and Mechanic Arts, Ames, Iowa 118, 119
Istituto Casanova, Naples, Italy 453
Istituto Pio IX degli Artigianelli di San Giuseppe, Rome, Italy 456
Istituto Professionale Maschile dell' Ospizio di San Michele a Ripa, Rome, Italy 456
Italy, present status of industrial education in 441-457
Ithaca, N. Y., College of Agriculture of Cornell University 123

J.

Jacksonville, Fla., manual training in 29
Jamaica Plain, Mass., Bussey Institution of Harvard University, an agricultural college 120, 121
Jamestown, N. Y., manual training in 59, 60
Jemmapes, Belgium, Industrial School 205

K.

Kansas, agricultural colleges in, consideration of 119
Kansas State Agricultural College, Manhattan, Kans 119
Kentucky, agricultural colleges in, consideration of 119
Kentucky, manual training schools in, consideration of 35

Page.
Kindergarten in relation to manual training, the 587-598
Kindergartens and manual training at Geneva, Switzerland 509-513
Kindergartens in Belgium, consideration of 163, 164
Kindergartens in Switzerland, consideration of 506, 507
King's College, London, England 411
Kingston, R. I., College of Agriculture and Mechanic Arts 124-127
Klagenfurth, Austria, manual training in 147
Klagenfurth, Austria, School for the Mechanic Arts 152
Knoxville College, Knoxville, Tenn., a manual training school 70
Knoxville, Tenn., manual training in 70
Knoxville, Tenn., State Agricultural and Mechanical College of the University of Tennessee. 128
Komisarof Technical School, Moscow, Russia 461, 462
Krupp's schools at Essen, Prussia 349, 350

L.

Ladies' Tailoring and Needlework, Trade School for, Zurich, Switzerland 546-549
Lafayette College, Easton, Pa., technical education in 135, 136
La Fayette, Ind., manual training in 35
La Fayette, Ind., School of Agriculture of Purdue University 118
Lake City, Fla., State Agricultural and Mechanical College 116, 117
La Louvière, Belgium, Industrial School 205, 206
La Martinière School, Lyons, France 268-271
Lambeth Polytechnic, London, England 409
Lancashire and Yorkshire Railway Company's School, Horwich, England 432
Las Cruces, N. Mex., Agricultural College of New Mexico 122, 123
La Spezia, Italy, Scuola d' Arti e Mestieri 448
Lawrence Scientific School, Cambridge, Mass 135
Leeds, England, Yorkshire College 423, 424
Leeds Mechanics' Institution, Leeds, England 426
Legislation for agricultural education 130, 131
Leipsic, Saxony, City Trade School 359, 360
Leipsic, Saxony, Royal Academy of Art 358, 359
Leland Stanford Junior University, Palo Alto, Cal., technical education in 136
Le Moyne Normal Institute, Memphis, Tenn., manual training in 70
Lenzburg, Switzerland, School for Servants 562-564
Lexington, Ky., Agricultural and Mechanical College of Kentucky 119
Liege, Belgium, Industrial School 206, 207
Liege, Belgium, School for Tailors 191
Liege, Belgium, Trade School for Girls (intermediate) 188
Lille, France, Industrial Institute of the North of France 290, 291
Lille, France, manual training in advanced primary school for girls in 242, 243
Lille, France, manual training in elementary primary schools for boys in 227, 228
Lille, France, manual training in elementary primary schools for girls in 233
Lille, Tourcoing, and Rouen, France, manual training in advanced primary schools for boys in. 241
Limoges, France, School of Ceramics 298, 299
Lincoln, Nebr., Industrial College of the University of Nebraska, agricultural education in ... 122
List of works relating to the subject of this report 663-686
Literary and Scientific Institution (Birkbeck), London, England 410, 411
Liverpool, England, School of Science and Technology 421
Liverpool School of Science and Technology, Liverpool, England 421
Locle, Switzerland, School of Watchmaking and Mechanics 513-516
Logan, Utah, Agricultural College of Utah Territory 128
London College for Men and Women, London, England 411, 412
London, England—
Battersea Institute 410
Beaumont Institute (or the People's Palace) 407, 408
Birkbeck Literary and Scientific Institution 410, 411
Central Institute 386, 387
Chelsea Institute 413
City of London College 412, 413
Clerkenwell Polytechnic Institute 413
College for Men and Women 411, 412
College for Working Women 412
Elephant and Castle Institute 410
Finsbury Technical College 387, 388
Goldsmiths' Company Institute 409, 410
King's College 411
Lambeth Polytechnic 409
North London institutes 413
People's Palace Day School 395, 396
People's Palace (or Beaumont Institute) 407, 408
Regent Street Polytechnic School 394, 395, 397-407
Royal Victoria Hall Science Classes 408
Louisiana, agricultural colleges in, consideration of 119
Louisiana, manual training schools in, consideration of 35-37
Louisiana State University and Agricultural and Mechanical College, Baton Rouge, La 119
Louisville, Ky., manual training in 36
Louvain, Belgium—
Housekeeping School 181, 182
Industrial School 207, 208
Lowell, Mass., manual training in 47
Lowell School of Practical Design, Boston, Mass., consideration of 111, 112
Lower Moseley Street Schools, Manchester, England 389
Luzzara, Italy, Scuola d'Arte Applicata all'Industria 450

Page.

Lyons, France—
Advanced School of Commerce and Weaving 285
Central Industrial School 300
La Martinière School 268-271
School of Industrial Chemistry 285, 286

M.

Madison, Wis., College of Agriculture of the University of Wisconsin 129
Maine, agricultural colleges in, consideration of 119, 120
Maine State College of Agriculture and the Mechanic Arts, Orono, Me. 119, 120
Manchester, England—
Lower Moseley Street Schools 389
Manual Training School 389, 390
Technical School 418-420
Technical School of Messrs. Mather and Platt 420
Manchester Technical School, Manchester, England 418-420
Manhattan, Kans., State Agricultural College 119
Mansfield, Conn., Storrs Agricultural School 116
Manual Apprenticeship, National School of, Armentières, France 262-265
Manual Apprenticeship School, Boulogne-sur-Mer, France 260
Manual Apprenticeship School for Boys, Reims, France 257-259
Manual Apprenticeship School for Boys, Saint-Etienne, France 255-257
Manual Apprenticeship School for the Book Publishing Industry, Paris, France 249-251
Manual Apprenticeship School, Nantes, France 259
Manual Apprenticeship School of Furniture Making, Paris, France 251, 252
Manual Apprenticeship School, Rouen, France 260
Manual Apprenticeship School, Saint-Chamond, France 259
Manual apprenticeship schools in France, consideration of 243-260
Manual apprenticeship schools, Paris, France 246, 247
Manual dexterity or workshop instruction, terms used in Germany for manual training 17
Manual instruction (elementary) in Great Britain, consideration of 384-386
Manual labor in agricultural colleges 130
Manual labor, term used for manual training in France 17
Manual training and kindergartens at Geneva, Switzerland 509-513
Manual training and trade instruction, effect of, upon the individual 651-662
Manual training and trade instruction in reformatories 621-650
Manual training at Genoa, Italy 444
Manual training at Naples, Italy 444
Manual training, book work in relation to, in France, consideration of 260
Manual training, called manual dexterity or workshop instruction in Germany 17
Manual training, called manual labor in France 17
Manual training, conference on 77-79
Manual training for boys in the public schools of Belgium, consideration of 168-170
Manual training for girls in the public schools of Belgium, consideration of 164-168
Manual training in—
advanced primary school for boys (Institute Turgot), Roubaix, France 238-241
advanced primary school for girls, Lille, France 242, 243
advanced primary schools for boys at Tourcoing, Rouen, and Lille, France 241
advanced primary schools for boys, Paris, France 237, 238
advanced primary schools for girls, Paris, France 241, 242
Austria, consideration of 143-148
conjunction with book work 599-620
Denmark, consideration of 492-498
elementary primary schools for boys, Lille, France 227, 228
elementary primary schools for boys, Paris, France 224-227
elementary primary schools for girls, Lille, France 233
elementary primary schools for girls, Paris, France 228-233
Germany, consideration of 305-328
grammar and high schools, United States 608-617
Saint Petersburg, Russia 462-464
Sweden, called sloid 17
Sweden, consideration of 490-492
Switzerland, consideration of 507-509
United States, consideration of 24-79
universities and technological schools, United States 618, 619
Manual training, its relation to the kindergarten 587-598
Manual training, origin of 16
Manual training, Russian method of, consideration of 16, 17
Manual training school, definition of term 15
Manual Training School, Manchester, England 389, 390
Manual training schools for teachers in Austria 144, 145
Manual training schools in America generally superior to those in Europe 18, 19
Manual training schools, results of 653-657
Manual training schools, United States:
Adler's, Dr. Felix, Workingman's School, New York, N. Y., manual training in 63, 64
Aiken, S. C., manual training in 70
Albany High School, Albany, N. Y. 57, 58
Albemarle, Miller Manual Labor School of, Crozet, Va. 71-76
Athens, Ga., University of Georgia 29-31
Atlanta, Ga., manual training for colored students in 31
Atlanta University, Atlanta, Ga 29
Baltimore School of Manual Training, Baltimore, Md. 37, 38
Beardstown, Ill., manual training in 32
Bishop College, Marshall, Tex., manual training in 71
Boston, Mass., manual training schools 40-44

Page.

Manual training schools, United States—Continued.
Brookline, Mass., Manual Training School 44, 45
Brooklyn, N. Y., Pratt Institute 58
Cambridge, Mass., Manual Training School 45–47
Central Tennessee College, Nashville, manual training for colored students in 71
Chicago Manual Training School, Chicago, Ill 32–34
Cincinnati, Ohio, Technical School 64, 65
Clark University, Atlanta, Ga 31
Cleveland, Ohio, Manual Training School 65, 66
Cogswell Polytechnic College, San Francisco, Cal 28
College of the City of New York, manual training in 61, 62
Columbia, S. C., manual training in 70
Concord, N. H., manual training in 54
Crozet, Va., manual training in 71–76
Duluth, Minn., manual training in 49
Durfee, B. M. C., High School, Fall River, Mass 47
Easton, Md., manual training in 38
Emerson Institute, Mobile, Ala. (colored) 26, 27
English High and Manual Training School, Chicago, Ill 34
Fall River, Mass., B. M. C. Durfee High School 47
Fisk University, Nashville, Tenn., manual training in (colored) 71
Georgia School of Technology, Athens, Ga 30, 31
Girard College, Philadelphia, Pa., manual training in 67, 68
Hartshorn Memorial College, Richmond, Va., manual training in 70
Hebrew Technical Institute of New York, N. Y 62, 63
Hoboken, N. J., manual training in 55, 56
Indianapolis, Ind., manual training in 35
Industrial Education Association of New York, N. Y., manual training in 63
Jacksonville, Fla., manual training in 29
Jamestown, N. Y., manual training in 50, 60
Knoxville College, Knoxville, Tenn 70
Knoxville, Tenn., manual training in 70
La Fayette, Ind., Purdue University 35
Le Moyne Normal Institute, Memphis, Tenn., manual training in 70
Louisville, Ky., manual training in 35
Lowell, Mass., manual training in 47
Marshall, Tex., manual training in 71
McDonogh School, near Baltimore, Md 38
Memphis, Tenn., manual training in 70
Miller Manual Labor School of Albemarle, Crozet, Va 71–76
Milwaukee, Wis., manual training in 77
Minneapolis, Minn., manual training in 49
Mobile, Ala., Emerson Institute 26, 27
Mont Clair, N. J., manual training in 56
Morristown Normal Academy, Morristown, Tenn., manual training in 71
New Britain, Conn., Normal Training School 28
Newburgh, N. Y., Manual Training School 60
Newcomb, H. Sophie, Memorial College, New Orleans, La 35, 36
New Haven, Conn., manual training in 28, 29
New Orleans, La., manual training in 35–37
New Orleans University, New Orleans, La 35
Newport, R. I., manual training in 69
New York city, N. Y., manual training in 60–64
Normal Training School, New Britain, Conn 28
North Bennet Street Industrial School, Boston, Mass 40, 41
Northeast School, Philadelphia, Pa 67
Oakland, Cal., manual training in 28
Omaha, Nebr., manual training in 53, 54
Orange, N. J., manual training in 56, 57
Paterson, N. J., manual training in 57
Peru, Ill., manual training in 34, 35
Philadelphia, Pa., Manual Training School 67
Pratt Institute, Brooklyn, N. Y., manual training in 58
Providence, R. I., manual training in 69
Purdue University, La Fayette, Ind 35
Richmond, Va., manual training in 76
Saint Louis, Mo., Manual Training School 50–53
Saint Paul, Minn., manual training in 49, 50
San Francisco, Cal., Cogswell Polytechnic College 28
Schofield Normal and Industrial School, Aiken, S. C. (colored) 70
Somerville, Mass., manual training in 47
Spelman Seminary, Atlanta, Ga 31
Springfield, Mass., Manual Training School 47–49
State Normal School, Milwaukee, Wis., manual training in 77
State Normal School, White Water, Wis., manual training in 76, 77
Straight University, New Orleans, La. (colored) 36, 37
Talladega College, Talladega, Ala 27
Technical School of Cincinnati, Ohio 64, 65
Tidioute, Pa., manual training in 68
Toledo, Ohio, Manual Training School 66, 67
Tulane High School, New Orleans, La 36
Tulane University of Louisiana, New Orleans 35, 36
Tuskegee Normal and Industrial Institute, Tuskegee, Ala. (colored) 27, 28
University of Georgia, Athens 29–31
Vineland, N. J., manual training in 57
Westerly, R. I., manual training in 69
White Water, Wis., manual training in 76, 77

Page.
Manual training schools, United States—Concluded.
Wiley University, Marshall, Tex., manual training in 71
Wilkes Barre, Pa., manual training in 68, 69
Winthrop Training School for Teachers, Columbia, S. C., manual training in 70
Workingman's School, Dr. Felix Adler's, New York, N. Y., manual training in 63, 64
Manufactures and Arts, Central School of, Paris, France 295, 296
Marchiennes au Pont, Belgium, Industrial School 208
Marshall, Tex., manual training in 71
Maryland Agricultural College 120
Maryland, agricultural colleges in, consideration of 120
Maryland, manual training schools in, consideration of 37, 38
Mason Science College, Birmingham, England 421, 422
Massachusetts Agricultural College, Amherst, Mass 120
Massachusetts, agricultural colleges in, consideration of 120, 121
Massachusetts Institute of Technology, Boston, Mass 132–134
Massachusetts, manual training schools, consideration of 39–49
Mather and Platt's Technical School, Manchester, England 420
McDonogh School, near Baltimore, Md., a manual training school 38
Mechanic Arts, Trade School of the, Klagenfurth, Austria 152
Mechanical Handicraft School, Moscow, Russia 462
Mechanics and Tradesmen, General Society of, New York, N. Y., consideration of 100, 101
Mechanics and Watchmaking, School of, Chaux-de-Fonds, Switzerland 516–520
Mechanics and Watchmaking, School of, Geneva, Switzerland 530–533
Mechanics and Watchmaking, School of, Locle, Switzerland 513–516
Mechanics' Institute, Cincinnati, Ohio, consideration of 110
Mechanics' Institution, Leeds, England 426
Memphis, Tenn., manual training in 70
Merchant Venturers' School, Bristol, England 421
Metal Working, School of, Winterthur, Switzerland 537–540
Michigan Agricultural College, Agricultural College P. O., Mich 121
Michigan, agricultural colleges in, consideration of 121
Michigan Mining School, Houghton, Mich., consideration of 112
Middle Georgia Military and Agricultural College, Milledgeville, Ga 117, 118
Milan, Italy, Technical Institute of 445, 446
Milan, Italy, Typographical School at 447
Military and Agricultural College of Middle Georgia, Milledgeville 117, 118
Milledgeville, Ga., Middle Georgia Military and Agricultural College 117, 118
Miller Manual Labor School of Albemarle, Crozet, Va 71–76
Milwaukee, Wis., manual training in 77
Miners, schools for master, Alais and Douai, France 294, 295
Mines and industry, schools of, in Belgium, consideration of 216
Mines, National High School of, Paris, France 293, 294
Mines, School of, Saint-Etienne, France 294
Mining School, Houghton, Mich., consideration of 112
Minneapolis, Minn., manual training in 49
Minnesota, agricultural colleges in, consideration of 121
Minnesota, manual training schools in, consideration of 49, 50
Mississippi, agricultural colleges in, consideration of 121
Missouri, agricultural colleges in, consideration of 121, 122
Missouri, manual training schools in, consideration of 50–53
Missouri School of Mines and Metallurgy, Rolla, Mo 139
Mobile, Ala., manual training in 26, 27
Mont Clair, N. J., manual training in 56
Mont Clair, N. J., public schools 589–593
Morgantown, W. Va., West Virginia University, agricultural education in 129
Morlanwelz, Belgium, Housekeeping School 181
Morlanwelz, Belgium, Industrial School 208, 209
Morristown Normal Academy, Tenn., manual training in 71
Moscow, Russia, Komisarof Technical School 461, 462
Moscow, Russia, Mechanical Handicraft School 462
Moscow, Russia, Strogonoff School of Technical Design and Museum of Art and Industry 462
Mülhausen, Alsace-Lorraine, Industrial Society of 371
Munich, Bavaria, Royal Technical School 362–364
Municipal drawing schools in France 300
Municipal School for the Apprenticeship of Boys, Havre, France 253–255
Municipal School of Art, Geneva, Switzerland 568
Museo Artistico Industriale e Scuole Officine, Naples, Italy 452
Museo Artistico Industriale e Scuole Officine, Palermo, Italy 454

N.

Namur, Belgium, course for steam engineers 197
Nantes, France, Institution Livet 272–275
Nantes, France, Manual Apprenticeship School 259
Nantes, France, School of Apprentices of the Industrial Society of 284
Naples, Italy—
Istituto Casanova 453
manual training at 444
Museo Artistico Industriale e Scuole Officine 452
Scuola di Chimica Applicata alle Arti della Società Centrale Operaia Napolitana 454
Scuola di Lavoro della Società per l'Educazione del Popolo 453
Scuola di Meccanica Pratica per gli Operai presso la Reale Università 454
Scuola Gratuita del Ritiro di Suor Orsola 454
Scuola Industriale Alessandro Volta 452
Scuola Professionale Femminile nel Ritiro del Santissimo Ecce Homo 454
Stazione Sperimentale per la Industria delle Pelli 454
Nashville, Tenn., manual training in 71

Page.
Nashville, Tenn., Vanderbilt University, technical education in 134, 135
National Association for the Promotion of Technical Education in Great Britain, consideration of 384
National Conservatory of Arts and Trades, Paris, France 296, 297
National High School of Mines, Paris, France 293, 294
National School for Training Foremen and Skilled Mechanics, Cluny, France 291
National School for Watchmaking, Cluses, France 265-267
National School of Bridges and Highways, Paris, France 292, 293
National School of Decorative Arts, Paris, France 297, 298
National School of Design for Girls, Paris, France 298
National School of Industrial Arts, Roubaix, France 299
National School of Manual Apprenticeship, Armentières, France 262-265
National School of Watchmaking, Electricity, and Applied Mechanics, Brussels, Belgium 196, 197
National Schools of Arts and Trades, Châlons, Angers, and Aix, France 286-290
National subsidies for industrial education in Switzerland, consideration of 501-505
Nebraska, agricultural colleges in, consideration of 122
Nebraska, manual training schools in, consideration of 53, 54
Need of technical education 102-105
Needlework and Art, School of, Zurich, Switzerland 560-562
Needlework and Ladies' Tailoring, Trade School for, Zurich, Switzerland 546-549
Neuchâtel, Switzerland, School of Watchmaking 520-522
Nevada, agricultural colleges in, consideration of 122
Newark, Del., Delaware College, agricultural education in 116
Newark Technical School, Newark, N. J., consideration of 101
New Britain, Conn., manual training in 28
New Brunswick, N. J., Rutgers Scientific School, agricultural education in 122
Newburgh, N. Y., Manual Training School 60
Newcastle, England, Durham College of Science 424, 425
Newcomb, H. Sophie, Memorial College, New Orleans, La., manual training in 35, 36
New Cross Institute, London, England 409, 410
New Hampshire, agricultural colleges in, consideration of 122
New Hampshire, manual training schools in, consideration of 54
New Haven, Conn., manual training in 28, 29
New Haven, Conn., Sheffield Scientific School of Yale University, agricultural education in 116
New Jersey, agricultural colleges in, consideration of 122
New Jersey, manual training schools in, consideration of 54-57
New Mexico, agricultural colleges in, consideration of 122, 123
New Orleans, La., manual training in 35-37
New Orleans University, New Orleans, La., manual training in 35
Newport, R. I., manual training in 69
New York, agricultural colleges in, consideration of 123
New York city, N. Y., manual training in 60-64
New York, manual training schools in, consideration of 57-64
New York, N. Y.—
General Society of Mechanics and Tradesmen, consideration of 100, 101
Institute for Artist-Artisans, consideration of 107-109
School of Industrial Art and Technical Design for Women, consideration of 109, 110
School of Messrs. Hoe & Co., consideration of 101, 102
New York Trade Schools, consideration of 80-83
Nice, France, school at 299
Normal and Agricultural Institute, Hampton, Va 129
Normal and Industrial School (Colored), Huntsville, Ala., agricultural education in 113, 114
Normal Training School, New Britain, Conn., a manual training school 28
North Alabama Agricultural School, Athens, Ala 114
North Bennet Street Industrial School, Boston, Mass., a manual training school 40, 41
North Carolina, agricultural colleges in, consideration of 123
North Carolina College of Agriculture and Mechanic Arts, Raleigh, N. C 123
North Dakota Agricultural College, Fargo, N. Dak 123
North Dakota, agricultural colleges in, consideration of 123
North Georgia Agricultural College, Dahlonega, Ga 118
North London institutes, London, England 413
Northeast School, Philadelphia, Pa., a manual training school 67
Northern Railway Company Trade School, Paris, France 280
Norway, Sweden, and Denmark. *See* Scandinavian countries.
Nottingham, England, University College 431
Nuremberg, Bavaria, Building Trade School 364, 365
Nuremberg, Bavaria, Women's Work School 365, 366

O.

Oakland, Cal., manual training in 28
Ohio, agricultural colleges in, consideration of 123
Ohio, manual training schools in, consideration of 64-67
Ohio Mechanics' Institute, Cincinnati, Ohio, consideration of 110
Ohio State University, Columbus, Ohio, agricultural education in 123
Omaha, Nebr., manual training in 53, 54
Opinions of English employers on technical education in Great Britain 434-437
Orange, N. J., manual training in 56, 57
Orangeburgh, S. C., College of Agriculture and Mechanics' Institute of Claflin University 127, 128
Oregon, agricultural colleges in, consideration of 123
Oregon State Agricultural College, Corvallis, Oreg 133
Origin of manual training 16
Orono, Me., State College of Agriculture and the Mechanic Arts 119, 120
Ospizio degli Artigianelli Bonanni, Rome, Italy 456
Ospizio di Tata Giovanni, Rome, Italy 456
Ostend, Belgium, Industrial School 209
Ostend, Belgium, School for Fishermen 197, 198

P.

Page.
Pädagogium, Vienna, Austria 147, 148
Palermo, Italy, Museo Artistico Industriale e Scuole Officine 454
Palo Alto, Cal., Leland Stanford Junior University, technical education in 136
Paris, France—
Bernard Palissy School in 301, 302
Central School of Arts and Manufactures 295, 296
Diderot School for Apprentices 247, 248
drawing in the public schools of 301
Germain Pilon School in 301
Gutenberg Typographical School 277, 278
industrial and housekeeping schools for girls 252, 253
Manual Apprenticeship School for the Book Publishing Industry in 249–251
Manual Apprenticeship School of Furniture Making 251, 252
manual apprenticeship schools in 246, 247
manual training in advanced primary schools for boys in 237, 238
manual training in advanced primary schools for girls in 241, 242
manual training in elementary primary schools for boys in 224–227
manual training in elementary primary schools for girls in 228–233
National Conservatory of Arts and Trades 296, 297
National High School of Mines 293, 294
National School of Bridges and Highways 292, 293
National School of Decorative Arts 297, 298
National School of Design for Girls 298
Polytechnic School 292
School of Industrial Physics and Chemistry 248, 249
School of the Eastern Railway Company 279, 280
schools of the Society for the Industrial Education of Women 281, 282
Trade School for Tailors' Apprentices 280, 281
Trade School for Watchmaking 281
Trade School of the Chaix Printing Company 278, 279
Trade School of the Northern Railway Company 280
trade schools at, consideration of 276, 277
Parochial trade schools in Belgium, consideration of 188, 189
Paterson, N. J., manual training in 57
Pennsylvania, agricultural colleges in, consideration of 123, 124
Pennsylvania, manual training schools in, consideration of 67–69
Pennsylvania State College, State College P. O., agricultural education in 123, 124
People's Palace Day School, London, England 395, 396
People's Palace (or Beaumont Institute), London, England 407, 408
Peru, Ill., manual training in 34, 35
Philadelphia Builders' Exchange school, consideration of 83, 84
Philadelphia, Pa.—
Drexel Institute, consideration of 94–98
Institute for Colored Youth, consideration of 84, 85
Manual Training School 67
textile school, consideration of 105–107
training in sewing and cooking in the public schools of 660–662
Physics and Chemistry (Industrial), School of, Paris, France 248, 249
Pia Casa di Lavoro, Florence, Italy 447
Polytechnic Institute, Auburn, Ala., an agricultural college 113
Polytechnic Institute, Clerkenwell, London, England 413
Polytechnic School (Lambeth), London, England 409
Polytechnic School, Paris, France 292
Polytechnic School, Regent Street, London, England 394, 395, 397–407
Polytechnic School, Zurich, Switzerland 584–586
Porentruy, Switzerland, School of Watchmaking 526–528
Prague, Austria, industrial education in 159, 160
Pratt Institute, Brooklyn, N. Y., consideration of 87–94
Pratt Institute, Brooklyn, N. Y., manual training in 58
Primary (advanced) schools in France, consideration of 233–243
Primary (elementary) schools in France, consideration of 221–233
Primary industrial schools in France, consideration of 262–286
Printing, Trade School of the Chaix Printing Company, Paris, France 278, 279
Professional Academy, Geneva, Switzerland 576, 577
Professional Improvement, School for, Saint Gall, Switzerland 575, 576
Professional Improvement, School for, Winterthur, Switzerland 573, 574
Professional school at Savona, Italy 449, 450
Providence, R. I.—
Brown University, agricultural education in 124
manual training in 69
School of Design, consideration of 111
Technical Drawing School, consideration of 110, 111
Prussia, industrial trade schools and continuation schools in, consideration of 336–350
Public library classes, South Shields, near Newcastle, England 425, 426
Public school system in Belgium, consideration of 163–170
Public school system in France, consideration of 219–260
Public schools, drawing in the, Paris, France 301
Public schools of Mont Clair, N. J 589–593
Public schools of Philadelphia, Pa., training in sewing and cooking in the 660–662
Public schools of the District of Columbia 593–598
Purdue University, La Fayette, Ind., manual training in 35
Purdue University, School of Agriculture of, La Fayette Ind 118

R.

Railway (Eastern) Company School, Paris, France 279, 280
Railway (Northern) Company Trade School, Paris, France 280
Raleigh, N. C., College of Agriculture and Mechanic Arts 123

Page.
Reformatories, manual training and trade instruction in 621-660
Regent Street Polytechnic School, London, England 394, 395, 397-407
Regulations (official) for industrial schools in Russia 479-483
Reims, France, Manual Apprenticeship School for Boys 257-259
Reims, France, School of Industrial Arts 300
Reno, Nev., School of Agriculture of the Nevada State University 122
Rensselaer Polytechnic Institute, Troy, N. Y 132
Results of manual training schools 653-657
Results of technical education in Great Britain, consideration of 434-437
Results of trade schools 657-660
Rhode Island, agricultural colleges in, consideration of 124-127
Rhode Island College of Agriculture and Mechanic Arts, Kingston, R. I 124-127
Rhode Island, manual training in, consideration of 69
Rhode Island School of Design, Providence, R. I., consideration of 111
Richmond, Va., manual training in 76
Riesbach, Switzerland, Industrial School 572, 573
Robert Gordon's College, Aberdeen, Scotland 392
Rodney, Miss., Alcorn Agricultural and Mechanical College 121
Rolla, Mo., Missouri School of Mines and Metallurgy 139
Rome, Italy—
Istituto Pio IX degli Artigianelli di San Giuseppe 456
Istituto Professionale Maschile dell' Ospizio di San Michele a Ripa 456
Ospizio degli Artigianelli Bonanni 456
Ospizio di Tata Giovanni 456
Scuola Femminile Torlonia 457
Scuola Professionale del Rione San Angelo 456
Victoria Home 456, 457
Rose Polytechnic Institute, Terre Haute, Ind 137, 138
Roubaix, France, manual training in the advanced primary school for boys (Institute Turget) in 238-241
Roubaix, France, National School of Industrial Arts 299
Rouen, France, Manual Apprenticeship School 260
Rouen, Tourcoing, and Lille, France, manual training in advanced primary schools for boys in 241
Royal Agricultural College, Cirencester, England 438
Royal Victoria Hall Science Classes, London, England 408
Russia—
official regulations for industrial schools in 479-483
present status of industrial education in 459-483
technical and trade education in, consideration of 470-479
Russian method of manual training, consideration of 16, 17
Rutgers Scientific School, New Brunswick, N. J., agricultural education in 122

S.

Saint Anthony Park, Minn., College of Agriculture of the University of Minnesota 121
Saint Anthony Park, Minn., State School of Agriculture 121
Saint-Chamond, France, Manual Apprenticeship School 259
Saint-Etienne, France, Manual Apprenticeship School for Boys 255-257
Saint-Etienne, France, School of Industrial Arts 299, 300
Saint-Etienne, France, School of Mines 294
Saint Gall, Switzerland, Drawing School for Trades and Industries 570, 571
Saint Gall, Switzerland, School for Professional Improvement 575, 576
Saint Imier, Switzerland, School of Watchmaking 528-530
Saint Louis Manual Training School, Saint Louis, Mo 50-53
Saint Paul, Minn., manual training in 49, 50
Saint Petersburg, Russia, Handicraft and Industrial School 462
Saint Petersburg, Russia, manual training in 462-464
Saint-Quentin, France, Trade School of the Industrial Society of 283, 284
Salzburg, Austria, State Industrial School 152, 153
San Francisco, Cal., manual training in 28
San Giovanni a Teduccio, Italy, Scuola di Disegno Industriale ed Elementi di Meccanica 455
Savona, Italy, professional school at 449, 450
Saxony, Hamburg, and Bremen, industrial trade schools and continuation schools in, consideration of 350-362
Scandinavian countries, present status of industrial education in 485-498
Schofield Normal and Industrial School, Aiken, S. C., manual training in (colored) 70
Scholarships, travelling, to graduates of industrial schools, in France, consideration of 302
School (Advanced) of Commerce and Weaving, Lyons, France 285
School at Nice, France 299
School (Central) of Arts and Manufactures, Paris, France 295, 296
School for—
Carpenters and Shoemakers, Bern, Switzerland 533-537
Fishermen, Blankenberghe, Belgium 198
Fishermen, Ostend, Belgium 197, 198
Professional Improvement, Saint Gall, Switzerland 575, 576
Professional Improvement, Winterthur, Switzerland 573, 574
Servants, Bern, Switzerland 557-560
Servants, Lenzburg, Switzerland 562-564
Silk Weaving, Wipkingen, near Zurich, Switzerland 541-544
Tailors, Brussels, Belgium 190, 194
Tailors, Liege, Belgium 191
Wood Carving, Brienz, Switzerland 540, 541
School of—
Agriculture of Purdue University, La Fayette, Ind 118
Agriculture of the Nevada State University, Reno, Nev 122
Apprentices of the Industrial Society of Nantes, France 284

Page.
School of—Concluded.
Art and Needlework, Zurich, Switzerland ... 560-562
Arts and Trades, Foligno, Italy ... 448, 449
Ceramics, Limoges, France ... 298, 299
Design, Providence, R. I., consideration of ... 111
Industrial Art and Technical Design for Women, New York, N. Y., consideration of ... 109, 110
Industrial Arts, Reims, France ... 300
Industrial Arts, Saint-Etienne, France ... 299, 300
Industrial Chemistry, Lyons, France ... 285, 286
Industrial Physics and Chemistry, Paris, France ... 248, 249
Messrs. Hoe & Co., New York, N. Y., consideration of ... 101, 102
Metal Working, Winterthur, Switzerland ... 537-540
Mines, Saint-Etienne, France ... 294
Tapestry, Aubusson, France ... 298
Technical Design and Museum of Art and Industry (Strogonoff), Moscow, Russia ... 462
The Eastern Railway Company, Paris, France ... 279, 280
The Philadelphia Builders' Exchange, consideration of ... 83, 84
Typography, Brussels, Belgium ... 191, 192
Watchmaking and Mechanics, Chaux-de-Fonds, Switzerland ... 516-520
Watchmaking and Mechanics, Geneva, Switzerland ... 530-533
Watchmaking and Mechanics, Locle, Switzerland ... 513-516
Watchmaking, Bienne, Switzerland ... 525, 526
Watchmaking, Fleurier, Switzerland ... 522, 523
Watchmaking, Neuchâtel, Switzerland ... 520-522
Watchmaking, Porentruy, Switzerland ... 526-528
Watchmaking, Saint Imier, Switzerland ... 528-530
Watchmaking, Soleure, Switzerland ... 524, 525
Weaving, Wattwyl, Switzerland ... 544-546
School shops in various Austrian cities ... 144
Schools for master miners, Alais and Douai, France ... 294, 295
Schools of agriculture in Great Britain, consideration of ... 437-440
Schools of industry and mines in Belgium, consideration of ... 216
Schools of the Society for the Industrial Education of Women, Paris, France ... 281, 282
Science and Technology, School of, Liverpool, England ... 421
Science classes at Royal Victoria Hall, London, England ... 403
Science College (Mason), Birmingham, England ... 421, 422
Scientific and Literary Institution (Birkbeck), London, England ... 410, 411
Scuola d'Arte Applicata all' Industria, Luzzara, Italy ... 450
Scuola d'Arti Applicata all' Industria, Chieti, Italy ... 454
Scuola d'Arti e Mestieri Gioeni, Girgenti, Italy ... 454
Scuola d'Arti e Mestieri, La Spezia, Italy ... 448
Scuola d'Arti e Mestieri nell' Istituto Artistico di San Lorenzo, Aversa, Italy ... 454, 455
Scuola d'Arti e Mestieri, Trapani, Italy ... 454
Scuola di Chimica Applicata alle Arti della Società Centrale Operaia Napolitana, Naples, Italy ... 454
Scuola di Disegno Industriale ed Elementi di Meccanica, San Giovanni a Teduccio, Italy ... 455
Scuola di Lavoro della Società per l'Educazione del Popolo, Naples, Italy ... 453
Scuola di Meccanica Pratica per gli Operai presso la Reale Università, Naples, Italy ... 454
Scuola d'Incisione sul Corallo, e d'Arti Decorative e Industriale, Torre del Greco, Italy ... 455
Scuola Femminile Torlonia, Rome, Italy ... 457
Scuola Gratuita del Ritiro di Suor Orsola, Naples, Italy ... 454
Scuola Industriale Alessandro Volta, Naples, Italy ... 452
Scuola Industriale, Triest, Austria ... 153, 154
Scuola Professionale del Rione San Angelo, Rome, Italy ... 456
Scuola Professionale di Fabriano ... 451
Scuola Professionale Femminile nel Ritiro del Santissimo Ecce Homo, Naples, Italy ... 454
Scuola Professionale, Foggia, Italy ... 455
Scuola Professionale Tipografica di Milano ... 447
Scuole Officine e Museo Artistico Industriale, Naples, Italy ... 452
Scuole Officine e Museo Artistico Industriale, Palermo, Italy ... 454
Secondary and higher institutions for industrial education in Great Britain, consideration of ... 386-396
Secondary industrial schools in France, consideration of ... 286-291
Seraing, Belgium, Industrial School ... 209, 210
Servants, School for, Bern, Switzerland ... 557-560
Servants, School for, Lenzburg, Switzerland ... 562-564
Sewing and cooking, training in the public schools of Philadelphia, Pa., in ... 660-662
Sheffield, England, Sheffield Technical School ... 390, 391, 422, 423
Sheffield Scientific School of Yale University, New Haven, Conn., agricultural education in ... 116
Sheffield Technical School, Sheffield, England ... 390, 391, 422, 423
Shoemakers and Carpenters, School for, Bern, Switzerland ... 533-537
Silk Weaving, School for, Wipkingen, near Zurich, Switzerland ... 541-544
Simmering, Austria, manual training in ... 144
Sloid, term used for manual training in Sweden ... 17
Society for the Industrial Education of Women, schools of the, Paris, France ... 281, 282
Solignies, Belgium, Industrial and Drawing School ... 210, 211
Soleure, Switzerland, School of Watchmaking ... 524, 525
Somerville, Mass., manual training in ... 47
Sorau, Prussia, Weaving School ... 345
South Carolina, agricultural colleges in, consideration of ... 127, 128
South Carolina, manual training schools in, consideration of ... 79
South Dakota Agricultural College, Brookings, S. Dak ... 128
South Dakota, agricultural colleges in, consideration of ... 128
South Georgia College, Thomasville, Ga ... 118
South London School of Technical Art, London, England ... 389
South Shields public library classes, near Newcastle, England ... 425, 426
Southeast Alabama Agricultural School, Abbeville, Ala ... 114
Southwest Georgia Agricultural College, Cuthbert, Ga ... 118
Special, industrial, and technical schools in Belgium, consideration of ... 170-176

Page.
Spremberg, Prussia, School of Weaving 341
Springfield Manual Training School, Springfield, Mass 47-49
Staats-Gewerbeschule, Grätz, Austria 150, 151
Staats-Gewerbeschule, Innsbruck, Austria 151, 152
Staats-Gewerbeschule, Salzburg, Austria 152, 153
Staats-Gewerbeschule, Triest, Austria 153, 154
Staats-Handwerkerschule, Klagenfurth, Austria, a manual training school 147
State Agricultural and Mechanical College, Lake City, Fla 116, 117
State Agricultural and Mechanical College of Texas, College Station 128
State Agricultural and Mechanical College of the University of Tennessee, Knoxville 128
State Agricultural College, Corvallis, Oreg 123
State Agricultural College, Manhattan, Kans 119
State Agricultural College of Colorado, Fort Collins 115, 116
State Agricultural College of the University of Vermont, Burlington 128, 129
State College of Agriculture and Mechanic Arts, Ames, Iowa 118, 119
State College of Agriculture and Mechanic Arts, Athens, Ga 117
State College of Agriculture and the Mechanic Arts, Hanover, N. H 122
State College of Agriculture and the Mechanic Arts, Orono, Me 119, 120
State College, State College P. O., Pa., agricultural education in 123, 124
State Colored Normal and Industrial School, Huntsville, Ala., agricultural education in 113, 114
State Normal School, Milwaukee, Wis., manual training in 77
State Normal School, White Water, Wis., manual training in 76, 77
State School of Agriculture, Saint Anthony Park, Minn 121
State University and Agricultural and Mechanical College, Baton Rouge, La 119
State University, Columbus, Ohio, agricultural education in 123
Stazione Sperimentale per la Industria delle Pelli, Naples, Italy 454
Steam engineers, course for, Namur, Belgium 197
Stevens Institute of Technology, Hoboken, N. J 138
Stockport, England, Industrial School 391, 392
Storrs Agricultural School, Mansfield, Conn 116
Strogonoff School of Technical Design and Museum of Art and Industry, Moscow, Russia 462
Subsidies (national) for industrial education in Switzerland, consideration of 501-505
Superior industrial schools in France, consideration of 291-297
Sweden, manual training called sloid in 17
Sweden, manual training in, consideration of 490-492
Sweden, Norway, and Denmark. *See* Scandinavian countries.
Switzerland—
classification of industrial schools in, consideration of 506
industrial art schools in 568-571
industrial education in, present status of 499-586
institutions for the education of working people in, consideration of 571-577
kindergartens in, consideration of 506, 507
manual training in, consideration of 507-509
national subsidies for industrial education in, consideration of 501-505
trade schools in, consideration of 513-568

T.

Tailors' Apprentices, Trade School for, Paris, France 280, 281
Tailors, School for, Brussels, Belgium 190, 191
Tailors, School for, Liege, Belgium 191
Talladega College, Talladega, Ala., a manual training school 27
Tamworth Agricultural College and Training Farm, Tamworth, England 439
Tamworth, England, Agricultural College and Training Farm 439
Tapestry, School of, Aubusson, France 298
Teachers' manual training schools in Austria 144, 145
Technical and industrial schools in Belgium, consideration of 170-176
Technical and trade education in Russia, consideration of 470-479
Technical and trade schools, consideration of 79-112
Technical and trade schools in America generally inferior to those in Europe 18, 19
Technical and trade schools, United States. *See* Trade and technical schools, United States.
Technical Art School of South London, London, England 389
Technical College, Bradford, England 414-418
Technical College, Finsbury, London, England 387, 388
Technical Drawing School, Providence, R. I., consideration of 110, 111
Technical Education in Great Britain, National Association for the Promotion of, consideration of 384
Technical education in Great Britain, opinion of English employers on 434-437
Technical education in Great Britain, results of, consideration of 434-437
Technical education, need of 102-105
Technical Institute, Coventry, England 431, 432
Technical Institute, Dundee, Scotland 429, 430
Technical Institute of Milan, Italy 445, 446
Technical instruction acts of Great Britain, consideration of 376, 377
Technical instruction at Bologna, Italy 445
Technical instruction in country districts in Great Britain 432-434
Technical School, Belfast, Ireland 431
Technical school, definition of term 15
Technical School, Huddersfield, England 414
Technical School (Komisarof), Moscow, Russia 461, 462
Technical School, Manchester, England 418-420
Technical School, Munich, Bavaria 362-364
Technical School, Newark, N. J., consideration of 101
Technical School of Cincinnati, Ohio, a manual training school 64, 65
Technical School of Messrs. Mather and Platt, Manchester, England 420
Technical School, Sheffield, England 390, 391, 422, 423
Technical schools at Birmingham, England 392-394

Page
Technical schools in Great Britain, consideration of 396-434
Technikum, the, Winterthur, Switzerland 577-584
Technological Industrial Museum, Vienna, Austria 154-156
Technological schools and universities in the United States, manual training in 618, 619
Technologisches Gewerbe-Museum, Vienna, Austria 154-156
Technology and Science, School of, Liverpool, England 421
Technology, consideration of institutes of 132-139
Technology, institute of, definition of term 16
Tennessee, agricultural colleges in, consideration of 128
Tennessee, manual training schools in, consideration of 70, 71
Terre Haute, Ind., Rose Polytechnic Institute 137, 138
Texas, agricultural colleges in, consideration of 128
Texas, manual training schools in, consideration of 71
Textile school, Philadelphia, Pa., consideration of 105-107
Thomasville, Ga., South Georgia Agricultural College 118
Tidioute, Pa., manual training in 68
Toledo, Ohio, Manual Training School 66, 67
Torre del Greco, Italy, Scuola d' Incisione sul Corallo, e d'Arti Decorative e Industriale 455
Tourcoing, Rouen, and Lille, France, manual training in advanced primary schools for boys in. 241
Tournay, Belgium, Industrial School 194, 195
Trade and continuation schools, Europe. *See* Continuation and trade schools, Europe.
Trade and continuation schools in Austria, consideration of 148-160
Trade and technical education in Russia, consideration of 470-479
Trade and technical schools, consideration of 79-112
Trade and technical schools in Europe generally superior to those in America 18, 19
Trade and technical schools, United States:
Armour Institute, Chicago, Ill 98, 99
Art Academy, Cincinnati, Ohio 110
Artist-Artisans, Institute for, New York, N. Y 107-109
Boston, Mass., Lowell School of Practical Design 111, 112
Brooklyn, N. Y., Pratt Institute 87-94
Builders' Exchange school, Philadelphia, Pa 83, 84
Chicago, Ill., Armour Institute 98, 99
Cincinnati, Ohio, Art Academy 110
Cincinnati, Ohio, Mechanics' Institute 110
Drexel Institute, Philadelphia, Pa 94-98
Free School of Mechanical Trades, Williamson School P. O., Pa 85-87
General Society of Mechanics and Tradesmen, New York, N. Y 100, 101
Hoe & Co.'s School, New York, N. Y 101, 102
Houghton, Mich., Mining School 112
Industrial Art and Technical Design, School of, for Women, New York, N. Y 109, 110
Institute for Artist-Artisans, New York, N. Y 107-109
Institute for Colored Youth, Philadelphia, Pa 84, 85
Lowell School of Practical Design, Boston, Mass 111, 112
Mechanics and Tradesmen, General Society of, New York, N. Y 100, 101
Mechanics' Institute, Cincinnati, Ohio 110
Michigan Mining School, Houghton, Mich 112
Mining School, Houghton, Mich 112
Newark Technical School, Newark, N. J 101
New York, N. Y., General Society of Mechanics and Tradesmen 100, 101
New York, N. Y., Institute for Artist-Artisans 107-109
New York, N. Y., School of Industrial Art and Technical Design for Women 109, 110
New York, N. Y., School of Messrs. Hoe & Co 101, 102
Ohio Mechanics' Institute, Cincinnati, Ohio 110
Philadelphia Builders' Exchange school, Pa 83, 84
Philadelphia, Pa., Drexel Institute 94-98
Philadelphia, Pa., Institute for Colored Youth 84, 85
Philadelphia, Pa., textile school 105-107
Pratt Institute, Brooklyn, N. Y 87-94
Providence, R. I., School of Design 111
Providence, R. I., Technical Drawing School 110, 111
Rhode Island School of Design, Providence, R. I 111
School of Design, Providence, R. I 111
School of Industrial Art and Technical Design for Women, New York, N. Y 109, 110
School of Messrs. Hoe & Co., New York, N. Y 101, 102
School of the Philadelphia Builders' Exchange, Philadelphia, Pa 83, 84
Technical Drawing School, Providence R. I 110, 111
Technical School, Newark, N. J 101
Textile school, Philadelphia, Pa 105-107
Watchmaking schools in various localities in the United States 99, 100
Williamson Free School of Mechanical Trades, Williamson School P. O., Pa 85-87
Women's School of Industrial Art and Technical Design, New York, N. Y 109, 110
Trade instruction and manual training, effect of, upon the individual 651-662
Trade instruction and manual training in reformatories 621-650
Trade School for—
Girls, Ghent, Belgium 187
Girls (intermediate), Antwerp, Belgium 187
Girls (intermediate), Liege, Belgium 188
Girls, rue des Terres Neuves, Brussels, Belgium 186
Girls, rue du Marais, Brussels, Belgium 182-185
Girls, rue du Poinçon, Brussels, Belgium 185, 186
Girls, Verviers, Belgium 187
Ladies' Tailoring and Needlework, Zurich, Switzerland 546-549
Tailors' Apprentices, Paris, France 280, 281
Watchmaking, Paris, France 281
Women, Basel, Switzerland 552-557
Women, Bern, Switzerland 549-552

Page.
Trade School, Ghent, Belgium 195, 196
Trade School, Leipsic, Saxony 359, 360
Trade School of the Chaix Printing Company, Paris, France 278, 279
Trade School of the Industrial Society of Saint-Quentin, France 283, 284
Trade School of the Northern Railway Company, Paris, France 280
Trade schools at Paris, France, consideration of 276, 277
Trade schools, definition of term 15
Trade schools for girls in Belgium 182-188
Trade schools founded by guilds and trades in Belgium, consideration of 189-193
Trade schools in Belgium, consideration of 193-198
Trade schools in Berlin, Prussia 341-345
Trade schools in Switzerland, consideration of 513-568
Trade schools (industrial) and continuation schools in Bavaria 362-366
Trade schools (industrial) and continuation schools in Prussia, consideration of 336-350
Trade schools (industrial) and continuation schools in Saxony, Hamburg, and Bremen, consideration of 350-362
Trade schools (industrial) and continuation schools in Würtemberg, consideration of 366-370
Trade schools (industrial) in Chemnitz, Saxony 357, 358
Trade schools (parochial) in Belgium, consideration of 188, 189
Trade schools, results of 657-660
Trades and Arts, National Conservatory of, Paris, France 296, 297
Trades and Arts, National Schools of, Châlons, Angers, and Aix, France 286-290
Training in sewing and cooking in the public schools of Philadelphia, Pa 660-662
Trapani, Italy, Scuola d'Arti e Mestieri 454
Travelling scholarships to graduates of industrial schools in France, consideration of 302
Triest, Austria, State Industrial School 153, 154
Troy, N. Y., Rensselaer Polytechnic Institute 132
Tucson, Ariz., agricultural university 114
Tulane High School, New Orleans, La., a manual training school 36
Tulane University of Louisiana, New Orleans, manual training in 35, 36
Tuskegee Normal and Industrial Institute, Tuskegee, Ala., manual training school (colored). 27, 28
Typographical School at Milan, Italy 447
Typographical School, Gutenberg, Paris, France 277, 278
Typography, School of, Brussels, Belgium 191, 192

U.

United States—
manual training in, consideration of 24-79
manual training in grammar and high schools in the 608-617
manual training in universities and technological schools in the 618, 619
present status of industrial education in the 21-130
Universities and technological schools in the United States, manual training in 618, 619
University College, Nottingham, England 431
University of Cincinnati, Cincinnati, Ohio, technical education in 136
University of Georgia, Athens, a manual training school 29-31
University of Illinois, Urbana, agricultural education in 118
University of Michigan, Ann Arbor, technical education in 139
Urbana, Ill., University of Illinois, agricultural education in 118
Utah, consideration of agricultural colleges in 128

V.

Vanderbilt University, Nashville, Tenn., technical education in 134, 135
Vermont, agricultural colleges in, consideration of 128, 129
Verviers, Belgium, Industrial School 211
Verviers, Belguim, Trade School for Girls 187
Victoria Home, Rome, Italy 456, 457
Vienna, Austria, manual training in 144
Vienna, Austria, Technological Industrial Museum 154-156
Villach, Austria, school of the wood working industry 156-158
Vineland, N. J., manual training in 57
Virginia Agricultural and Mechanical College, Blacksburgh, Va 129
Virginia, agricultural colleges in, consideration of 129
Virginia, manual training schools in, consideration of 71-76

W.

Watchmaking and Mechanics, School of, Chaux-de-Fonds, Switzerland 516-520
Watchmaking and Mechanics, School of, Geneva, Switzerland 530-533
Watchmaking and Mechanics, School of, Locle, Switzerland 513-516
Watchmaking, Electricity, and Applied Mechanics, National School of, Brussels, Belgium 196, 197
Watchmaking, National School for, Cluses, France 265-267
Watchmaking, School of, Bienne, Switzerland 525, 526
Watchmaking, School of, Fleurier, Switzerland 522, 523
Watchmaking, School of, Neuchâtel, Switzerland 520-522
Watchmaking, School of, Porentruy, Switzerland 526-528
Watchmaking, School of, Saint Imier, Switzerland 528-530
Watchmaking, School of, Soleure, Switzerland 524, 525
Watchmaking schools in the United States, consideration of 99, 100
Watchmaking, Trade School for, Paris, France 281
Wattwyl, Switzerland, School of Weaving 544-546
Weaving and Commerce, Advanced School of, Lyons, France 285
Weaving, Dyeing, and Finishing, School of, at Crefeld, Prussia 338-341
Weaving school, Glasgow, Scotland 430, 431

Page.
Weaving School, Sorau, Prussia 345
Weaving School, Spremberg, Prussia 341
Weaving School, Wattwyl, Switzerland 544–546
Westerly, R. I., manual training in 69
West Georgia Agricultural and Mechanical College, Hamilton, Ga 118
West Virginia, agricultural colleges in, consideration of 129
West Virginia University, Morgantown, W. Va., agricultural education in 129
White Water, Wis., manual training in 76, 77
Wiener-Neustadt, Austria, manual training in 144
Wiley University, Marshall, Tex., manual training in (colored) 71
Wilkes Barre, Pa., manual training in 68, 69
Williamson Free School of Mechanical Trades, Williamson School P. O., Pa., consideration of. 85–87
Winterthur, Switzerland, School for Professional Improvement 573, 574
Winterthur, Switzerland, School of Metal Working 537–540
Winterthur, Switzerland, the Technikum 577–584
Winthrop Training School for Teachers, Columbia, S. C., manual training in 70
Wipkingen, near Zurich, Switzerland, School for Silk Weaving 541–544
Wisconsin, agricultural colleges in, consideration of 129
Wisconsin, manual training schools in, consideration of 76, 77
Women, schools of the Society for the Industrial Education of, Paris, France 281, 282
Women, Trade School for, Basel, Switzerland 552–557
Women, Trade School for, Bern, Switzerland 549–552
Women's School of Industrial Art and Technical Design, New York, N. Y., consideration of . 109, 110
Women's Work School at Nuremberg, Bavaria 365, 366
Wood Carving, School for, Brienz, Switzerland 540, 541
Wood working industry, trade school of the, Bruck, Austria 149, 150
Wood working industry, trade school of the, Hall, Austria 151, 152
Wood working industry, trade school of the, Villach, Austria 156–158
Worb, Switzerland, Housekeeping School 566–568
Worcester, Mass., Worcester Polytechnic Institute 136, 137
Worcester Polytechnic Institute, Worcester, Mass 136, 137
Workingman's School, Dr. Felix Adler's, New York, N. Y., manual training in 63, 64
Workingmen's School, Bern, Switzerland 574
Working people in Switzerland, institutions for the education of, consideration of 571–577
Working Women, College for, London, England 412
Workshop instruction or manual dexterity, terms used in Germany for manual training 17
Würtemberg, industrial trade schools and continuation schools in, consideration of 366–370

Y.

Yorkshire College, Leeds, England 423, 424

Z.

Zurich, Switzerland—
Industrial Art School 569, 570
Industrial School 574, 575
Polytechnic School 584–586
School of Art and Needlework 560–562
Trade School for Ladies' Tailoring and Needlework 546–549

O